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ROLE OF MRI IN CHARACTERIZATION OF BONE TUMORS ASSUMING HISTOPATHOLOGY AS GOLD STANDARD

Radio-Diagnosis

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ABSTRACT

Introduction- In comparison to other neoplasms, bone tumor is relatively not so common and constitutes only 0.5% of the total world cancer incidence. Evaluation of bone neoplasms consists of a multimodality approach and whereas cross sectional imaging has extraordinarily improved the ability to characterize tumors.

Aim And Objective- This study aims at evaluating MRI imaging pattern of bone tumors and their correlation with histopathology.

Materials And Method: 80 patients with suspected bone tumors referred to Department of Radiology after fulfilling the inclusion criteria were included in the study. Contrast enhanced MRI orbit was performed and findings were corelated with histopathology.

Results: Amongst 80 patients, 48 were males(60%) and 32 were female(40%).The patient age ranged from 1 month to 55 year. The bone tumors consist of 50 malignant and 30 benign masses amongst which osteosarcoma and enchondroma were the most common respectively.

Conclusion: The present study concludes that MRI is extremely useful modality to characterize bone tumors.

KEYWORDS

MRI, Bone tumors

INTRODUCTION

In comparison to other neoplasms, bone tumor is relatively not so common and constitutes only 0.5% of the total world cancer incidence (1). Radiographs provide useful information regarding lesion location, margin, cortical involvement, matrix, mineralization and adjacent periosteal reaction. Imaging these days comprises of a more advanced techniques including computed tomography and magnetic resonance imaging.

The ability of CT to improve lesion characterization in both soft-tissue and bony lesions makes it a useful diagnostic tool. The capability of displaying minor differences in tissue density allows for improved recognition of both tissue type and tumor involvement. Unfortunately, in the absence of specific identifiable clues, CT imaging reveals masses that may enlarge or distort normal anatomy but fail to confirm a specific histologic diagnosis.

While CT remains an important imaging modality, MRI has replaced the need for CT scans in many cases of musculoskeletal neoplasia. MRI is the best radiological investigation for focal extent and local staging (2). MR imaging usually tells the extent of soft tissue masses much better than CT. This is particularly true in areas such as the leg, arm and foot where fat planes are poorly delineated by CT. The excellent contrast resolution and multi-planar capabilities of MRI has resulted in improved evaluation of both intra-compartmental and extra-compartmental extent of bone. This is particularly true with regards to muscular invasion, neurovascular structures involvement and adjacent fat planes and degree of marrow involvement. MRI has also been shown to be better in assessing intra-articular extension and the presence of intra-tumoral necrosis and haemorrhage (3).

MRI is the investigation of choice to detect skip lesions (small metastasis separated from primary tumour by healthy tissue) which are often missed by other imaging means. Contrast-enhanced MRI can reveal the most vascularised parts of the tumour and MRI guidance makes it possible to avoid biopsing necrotic areas. (4). Moreover, newer 3 Tesla MRI's are faster with improved signal to noise ratio, resulting in better resolution and contrast. (5)

MATERIALS AND METHODS

The present study was hospital based cross-sectional study conducted on 80 patients in Department of Radio-diagnosis, SMS Medical college, Jaipur. After approval from ethics committee, patient referred from Department of orthopedics with suspected bone tumor were included in the study.

MRI Was Performed Using 3T MRI Phillips Ingenia machine.

TECHNIQUE:

The following MRI protocol for suspected bone tumor patients was used with slice thickness of 3mm and inter-slice gap of 0.5mm:

- Sagittal/Axial T1
- Axial, coronal and sagittal T2 images
- T2 STIR coronal/axial
- Axial and sagittal post contrast fat sat T1W images.
- DWI in axial plane

RESULTS:

- In our study the most common age group was between 15-24 years age group
- The male to female ratio was 1.5:1
- The most common bone involved in our study was proximal tibia
- In our study metaphysis was the most common part of bone involved.
- Osteosarcoma was the most common tumour and most common malignant tumour seen in our study while enchondroma was the most common benign tumour
- In our study the histopathology showed 30 benign bone tumours and 50 malignant bone tumours.

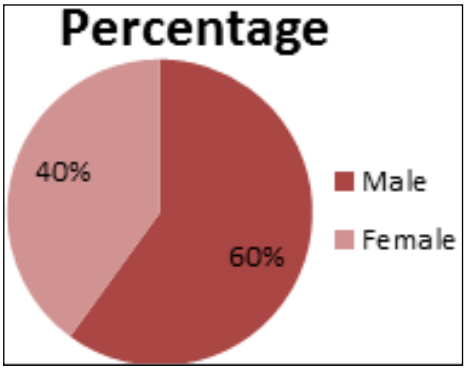

Figure 1: Showing sex distribution of cases.

Table 1: Distribution Of Malignant Tumors

Histo-pathological diagnosis		
Malignant Lesions	**Number**	**Frequency**
Osteosarcoma	**20**	**40%**
Ewing's sarcoma	**17**	**34%**
Chondrosarcoma	**8**	**16%**
Malignant GCT	**2**	**4%**
Telangiectatic steosarcoma	**3**	**6%**

Table 2: Distribution Of Benign Tumors

Histopathological diagnosis		
Benign lesions	Number of subjects	Frequency
Enchondroma	7	23.3%
GCT	5	16.7%
ABC	3	10%
Osteoid osteoma	3	10%
Chondroblastoma	4	13.3%
Fibrous dysplasia	2	6.7%
Osteochondroma	3	10%
Non-ossifying fibroma	2	6.7%
Chondromyxoid fibroma	1	3.3%

DISCUSSION

In 2008, Simpfendorfer CS, Ilaslan H et al (6) studied that does the presence of focal normal marrow fat signal within a tumour on MRI exclude malignancy, and analysed 184 histologically proven tumours of the pelvic and appendicular skeleton.

In 2015, Lee, You Seon Song et al (7) studied Bone Tumours with an Associated Pathologic Fracture: Differentiation between Benign and Malignant Status Using Radiologic Findings. There were 22 benign and 56 malignant bone tumours. They concluded that some factors can significantly differentiate between benign and malignant tumours; specifically, ill-defined tumour margin, the presence of sclerotic tumour margin and an extra-osseous soft tissue mass, the absence of cystic/necrotic/haemorrhagic portions in a mass, the homogeneous enhancement pattern, and the presence of a displaced fracture and of underlying cortical change were suggestive of malignant pathologic fractures.

In our study osteosarcoma was the most common malignant tumor and in majority of cases showed predominantly T1 iso-hypointense to muscle and T2 heterogeneously hyperintense with significant soft tissue extension as stated by Redmond et al (9).

Giant cell tumors showed low intensity on T1-weighted images and heterogeneously high intensity on T2-weighted images as concluded by Shaligram Purohit et al(8).

CONCLUSIONS

The present study therefore do indicate that MRI is extremely useful modality to study the spectrum and distinctive imaging features of bone tumors due to its superior soft tissue contrast and more accurate depiction of different orbital compartments and better delineation of soft tissue extent.

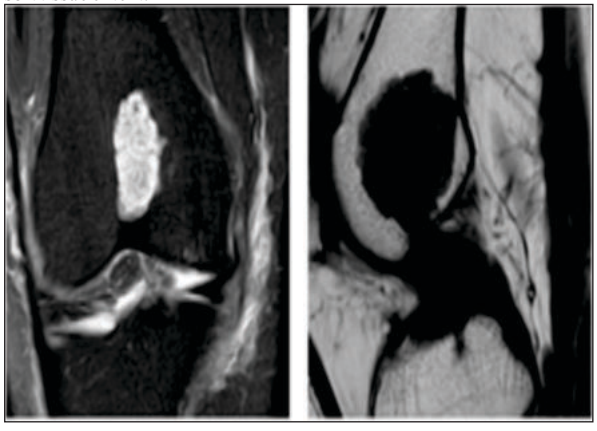

Figure 2: A 20 year old female with pain in right knee. Well defined oval shaped lobulated intramedullary T1 hypointense and T2 STIR hyperintense lesion noted in meta-epiphyseal region of right distal femur. Histopathological diagnosis was enchondroma.

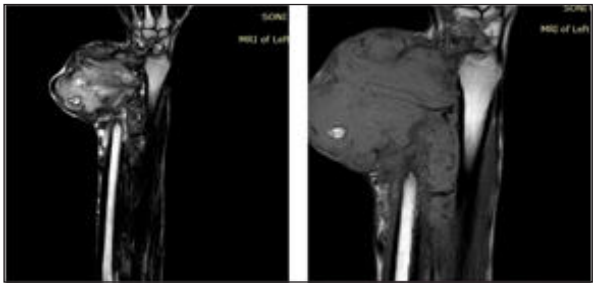

Figure 3: A 23 year old male patient had swelling in left wrist. A heterogeneous lesion arising from epi-metaphysis of left distal ulna. Lesion is predominantly T1 iso-hypointense to muscle and T2 heterogeneously hyperintense. Histopathological diagnosis was Osteosarcoma.

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