ORIGINAL ARTICLE

X-RAY AND MRI CORRELATION OF BONE TUMOURS

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ABSTRACT

Introduction: The evaluation of all skeletal lesions should begin with plain radiographic imaging. These images give basic information about its site, its location,its morphology, its aggressiveness. After the initial plain radiographic evaluation, the next imaging modality of choice is MRI. its clinical applications in the form of diagnostic and therapeutic monitoring has reached a new height in musculoskeletal imaging1.

Method: Correlating x-ray findings with mri findings to know the sensitivity and specificity of each diagnostic modality and to know role of each in planning management 30 patients were studied,The plain film included at least 2 projection depending on location and then patients underwent MRI.

Result: MRI is useful for information regarding soft tissue component, periosteal reaction where as XRAY is useful for information regarding bone and tumour calcification

Keywords: Bone tumor, X-ray, MRI

INTRODUCTION

XRAY is basic investigation for any bony lesion which can be useful as a screening test. Ever since the first report of Magnetic Resonance Imaging (**MRI**) of the wrist by Hinshaw and colleagues in 1979, its clinical applications in the form of diagnostic and therapeutic monitoring has reached a new height in musculoskeletal imaging.[1,2] In the past two decades, MRI has evolved to become the modality of choice for the diagnosis, evaluation and post-therapy monitoring of primary bone tumors. This is because MRI is non-invasive, provides excellent soft tissue contrast with high sensitivity for soft tissues and bone marrow and its multiplanar imaging capabilities without use of harmful ionising radiation.[3,4]

However, MRI evaluation of bone tumors can be challenging, because it not only requires knowledge of the various tumors along with their histopathology, age incidence and locations; but also because certain types of tumors are easily diagnosed by MRI while a substantial number of musculoskeletal tumors have no specific MR imaging characteristics.[5,6]

Another confounding factor is that some tumors that appear aggressive by MRI criteria are actually benign appearing lesions on plain radiography; and vice versa. In evaluation of bone tumors, Plain radiography, MRI, and if need be,computed axial tomography (**CT**) and nuclear medicine all work hand in hand and; each to different degrees, aid in the staging and treatment planning.

METHODOLOGY

Total 30 patients (either suspected or proven cases of bone tumors) were studied during the period of May 2015 to November 2015. All patients were evaluated with plain film examination. The plain film included at least 2 projections (Anteroposterior and Lateral projection) and depending on location and extent of pathological process, patients underwent MRI with body, head and surface coils on MAGNETOM Essenza 1.5 Tesla MRI Scanner from SIEMENS at AatmaJyoti MRI Centre, New Civil Hospital, Surat

The MRI centre is of public-private partnership type. MRI examinations were performed using 1.5 Tesla MRI machine from Siemens.

1) Coronal oblique T1W/ proton density weighted (PDW) fast spin echo (FSE) sequence.
2) Coronal oblique fat suppressed (FS) PDW FSE / T2 – W FSE sequence.
3) Sagittal oblique T2 W FSE sequence (with / without fat suppression).
4) Axial T2 – W gradient echo (GRE) sequence.

5) Axial PDW FSE (with / without fat suppression)

Field of view 14-16 cm, slice thickness 2-3 mm and matrix 512 x 512

RESULT

Of the total 30 patients in the study, maximum (36.67%) belonged to the age group 10-20 yrs and the least no of patients (3.33%) belonged to the age group above 60 yrs. Out of the 30 patients in the study, the most common symptom was pain (70%) followed by swelling which was present in 50% patients. Systemic symptoms like loss of weight were present in 26.67 % of patients. Restriction of movement was present in 3.3% patients, more commonly among patients with adjacent joint involvement as demonstrated on the MRI scan. Fever was present in 16.67% patients. Most of the patients with Ewing's sarcoma had systemic symptoms.

Table 1: Type of lesion (n=30)

Type of Lesion	No. (%)
Lytic	14 (46.7)
Sclerotic	3 (10.0)
Mixed	13 (43.3)

Out of the 30 patients in the study, the most common type of lesion was Lyticpresent in 46.7 % of patients followed by mixed type which was present in43.3% of patients.

Table 2: Site of Lesion (n=30)

Site of Lesion	No. (%)
Diaphysis	8 (26.7)
Metaphysis	8 (26.7)
Meta- Diaphysis	4 (13.3)
Meta-Epiphysis	9 (30.0)
Others (Vertebra/Skull)	1 (3.3)

Of the 30 patients studied in the group, the most common site of the lesion in long bone was Meta-epiphyseal region (30 %) followed by equal distribution in Diaphysis (26.7 %) and Metaphysis (26.7 %).

MRI is 100% sensitive and 100% specific for diagnosing periosteal reaction. In the study group of 30 patients with primary bone tumors, 53.33% shows soft tissue component. Positive predictive value of MRI as a diagnostic test for soft tissue component in our study group is 100 % In the study group of 30 patients with primary bone tumors, 56.67% shows soft tissue component.

DISCUSSION

The long bones and spine are the frequent sites of primary malignant bone tumors and multiple myeloma respectively. This study is aimed at highlighting the role of plain radiography and the benefits of MRI imaging in diagnosis, local staging and its impact on the management. Plain radiograph is indispensable in the imaging of any bone neoplasm and usually the first investigation performed. In malignant bone tumor of the long bones like osteogenic sarcoma/PNET, the patients are treated with chemotherapy and surgical excision. An adequate understanding of the nature of the lesion, its exact marrow extent, its relationships with the surrounding soft tissues, muscles and the neurovascular bundles and detection of skip lesion is vital in planning the line of treatment. Similarly, adequate extent and site of number of lesions in multiple myeloma is mandatory for symptomatic treatment like vertebroplasty, radiotherapy etc.[7,8]

The first step in the management of the bony lesion is establishment of a diagnosis. This makes biopsy essential. Planning of the biopsy approach is vital, as it has to be in a region where the incision for excision of the lesion is planned. Also it has to be placed such that it avoids any vital structures and other compartments. MRI with its brilliant anatomical details regarding the extent of the lesion and delineation of surrounding important structures is invaluable in biopsy planning. Another important aspect regarding biopsy is the identification of viable areas in a tumor as on histopathological examination, well vascularized viable tumor will be of greater value for determining the tumor type and grade than a biopsy specimen containing a mixture of poorly vascularized tumor tissue, edema or necrotic material. Blood flow through malignant tumors is not uniform and most tumors contain both highly perfused and sluggishly perfused areas. During the first-pass of the contrast agent in a tumor, the most richly vascularized areas will appear brighter than other tumor components as a result of a faster enhancement. After a few minutes differences in enhancement will be more difficult to identify, because as a result of a very short distribution halflife, useful advantage of MRI is the detection of skip or metastatic lesions which are not so easily picked on conventional imaging. This is extremely useful in planning the

surgical intervention, as areas of skip lesions have to be included in the surgical resection. [9]

However, X-ray still remains better than MRI in detecting tumor calcification. In our study, 7 patients showed calcification in plain radiographs. But still modality of choice is CT scan. In last decade, in addition to role of MRI in local staging, the recent advances of dynamic contrast enhanced MRI (DCE-MRI) is used for therapeutic monitoring of preoperative chemotherapy response and used to predict the percentage of tumor necrosis in order to differentiate responders from non responders.

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