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Radiography in Skeletal Tumours

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Abstract
Background: *Radiography is the optimal initial imaging modality for evaluating undiagnosed primary bone tumors. Anatomic location allows the evaluation of characteristics of activity or growth rate of primary bone tumors, such as margins, periosteal reaction, cortical expansion, thinning, and destruction.*
Objective: *To establish radiography (X-ray) is the initial imaging modality for differential diagnosis of primary bone tumors*
Methods: *Prospective study of skeletal with radiography.*
Results: *30 cases of skeletal tumours were studied including both benign and malignant masses.*
Conclusions: *Conventional radiograph is initial, affordable, easily available and effective imaging modality.*

Introduction

The saga of radiology's foray into the realm of skeletal tumours is as old as the advent of angelic rays themselves. Of the simple uses they found in those early days, delineation of skeletal lesions was to be their pioneering conquest.

The five basic edicts – essential to accurate diagnosis – remain much the same, and are:

1. Age of the patient
2. Bone involved
3. The area (or areas) of the bone involved,
4. Radiographic appearance of the bone
5. Adjacent tissues and the microscopic appearance.[(5)]

If has been thus, that conventional radiology has held the centre stage in detection and diagnosis of skeletal tumours for many years. Its penchant for clarification of peripheral lesions, skeletal mineralization and joints makes it an automatic choice in identifying lesions of the appendicular skeleton. Through varied appropriate projections and techniques, many distinguishing features such as sclerosis, periosteal new bone formation, cortical destruction, and the amount and patterns of the calcification can be identified to good purpose.[(8)]

Aims and Objectives

To establish radiography (X-ray) is the initial imaging modality for differential diagnosis of primary bone tumors

Materials and Methods

The present study was conducted in the medical institute over period of two years.

All clinically suspected patients of skeletal tumours were taken up for roentenological. Patients of all ages and both sexes attending the outdoor clinics or admitted in the wards were the subjects of this study.

A detailed clinical appraisal, which included complete history and thorough clinical examination, was done in all the patients.

Each patient was then subjected to conventional skiagrams. The joint nearest to the site of neoplasm was always included. Adequate coverage of the adjacent areas was made to demonstrate any skip lesion.

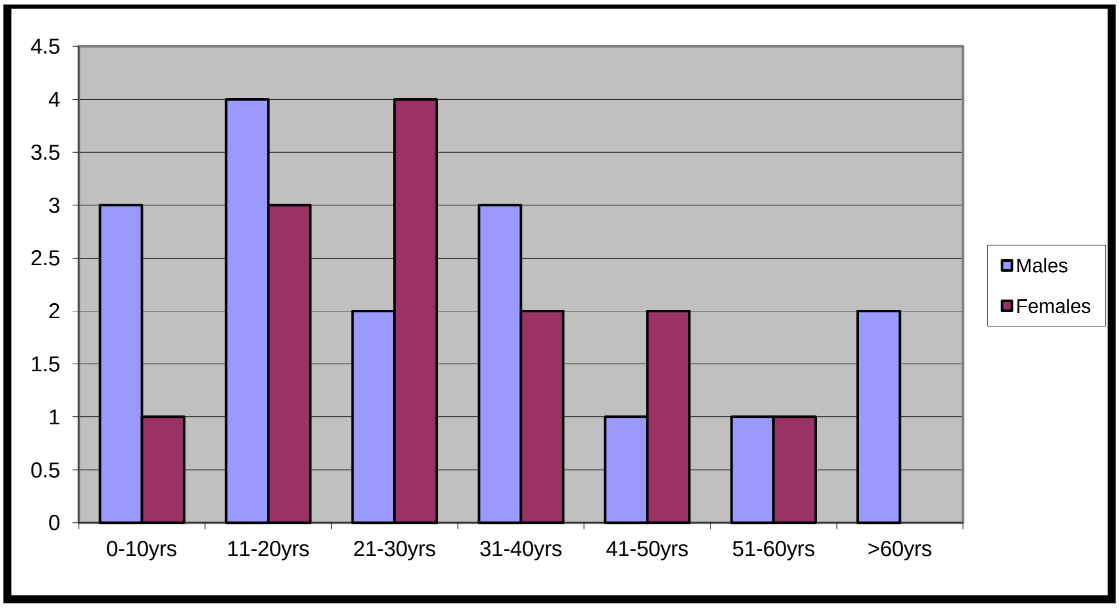
Results and Observations

A total of 30 patients with clinical suspicion of skeletal neoplasms were included in the present study.

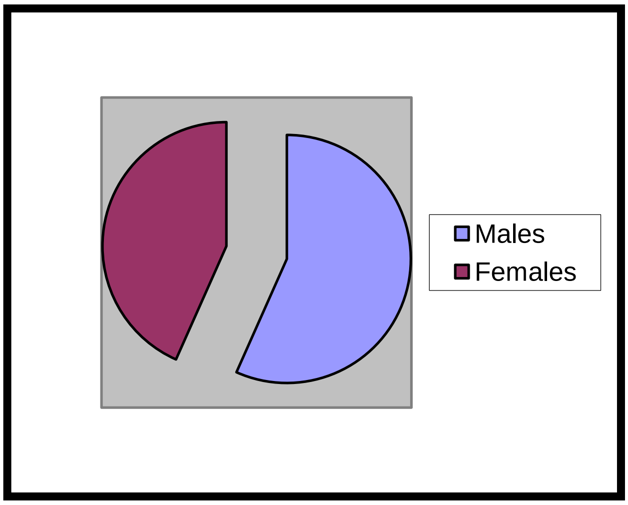
Table I : Age and Sex Distribution

Sl. No.	Age in years	Males	Females	Total number	% age
1	0-10	3	1	4	13.3%
2	11-20	4	3	7	23.3%
3	21-30	2	4	6	20%
4	31-40	3	2	5	16.67%
5	41-50	1	2	3	10%
6	51-60	1	1	3	10%
7	>61	2	0	2	6.6%

1. The age of these patients ranged from 1yr7mon to 82 yrs.
2. The maximum number of patients evaluated belonged to second decade (23%) followed by third (20%)
3. Of the total 30 patients, 17(56.6%) were males and 13 (43.3%) were females. The male: female ratio being 3:2.



Age and Sex Distribution



Sex Distribution

Table II: Mode of Presentation

Symptoms	No. of patients	Percentage
Bone Lesions (30)		
Pain	30	100%
Swelling	26	86.6%
Restricted mobility	9	30%

1. Among bone lesions pain was the most common presenting complaint and universally seen in all the patients (100%).
2. Among soft tissue lesions, however, swelling was more common and present in all patients (100%)
3. The most common clinical sign was swelling (90%).

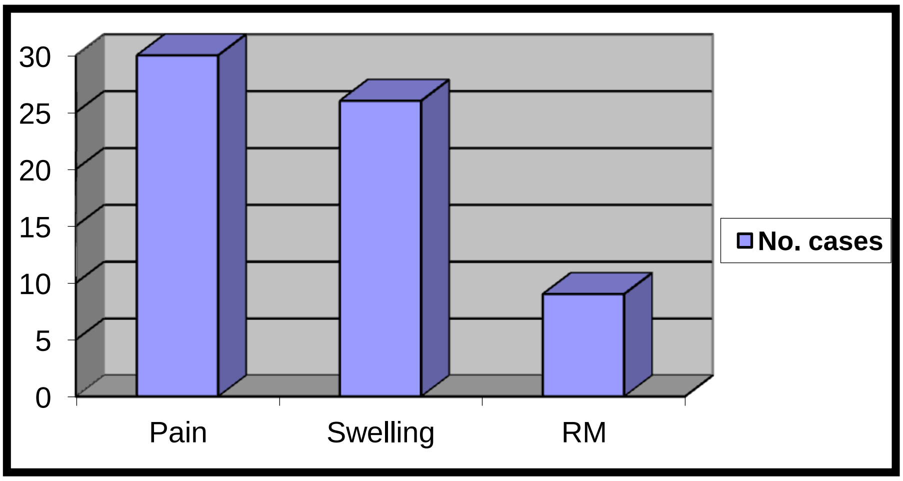


Fig. Bone lesion

1. The maximum duration of illness was > 2 years seen in a patient with osteochondroma and minimum was 2-3 month in a child diagnosed to have Ewing's sarcoma.
2. Maximum number of patients 15(50 %) presented 7 – 12 months after the onset of their symptoms.

Table III Duration of Illness

Duration of Illness	No. of Patients	Percentage
0 – 3 months	3	10%
4 – 6 months	6	20%
7 – 12 months	15	50%
13 – 24 months	4	13.3%
>24 months	2	6.6%

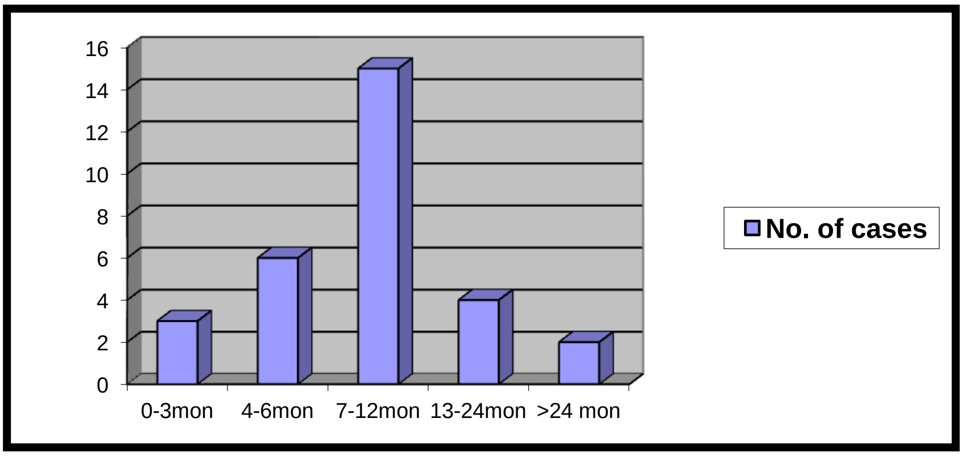


Table IV: Anatomical Distribution of Lesions Bone Lesions

Long bones (56.6%)			Flat bones (26.6%)		
	No. of cases	Percentage		No. of cases	Percentage
Femur	9	30	Scapula	1	3.3
Tibia	4	10.33	Vertebra	3	10
Radius	2	6.6	Skull	3	10
Fibula	2	6.6	mandible	1	3.3

-Long bones (56.6%) were more frequently involved than flat bones (26.6%).
30% of bone lesions arose in femur.

Table V: Pattern of Destruction of Plain Skiagrams

Sl. No.	Pattern of destruction	Number	Percentage
1	IA	1	3.3
2	IB	6	20
3	IC	1	3.3
4	II	9	30
5	III	13	40.33

1. 40.3% of bone lesions showed permeative type of bone destruction.
2. Moth eaten and geographic lytic pattern were seen in 30% and 20% of patients respectively.
3. 100% of giant cell tumours showed type IB pattern.

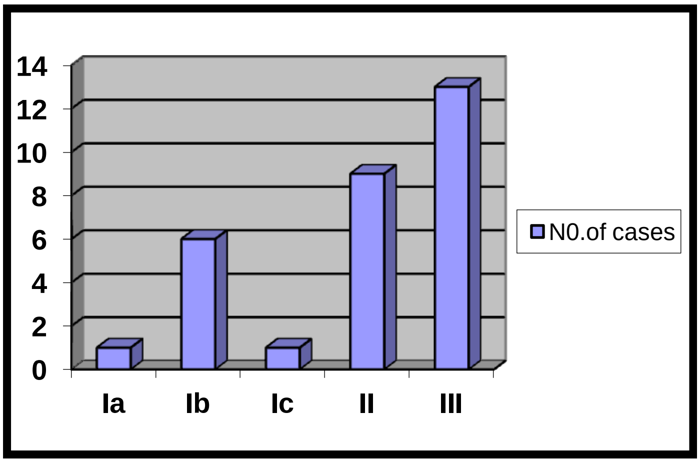


Table VI: Type of Periostel Reaction

Periosteal Reaction	No. of Cases	Percentage
Continuous	3	30
Interrupted	5	50
Complex	2	20

1. Of 30 bone tumours, only 10 cases show periosteal reaction (33%).
2. Interrupted periosteal reaction was the most common type, seen in 50% of the lesions showing periosteal reaction.
3. The most common bone tumour showing periosteal reaction was osteogenic sarcoma (100%) followed by Ewing's sarcoma (40%)

Table VIII: Histopathological Diagnosis among Bone Lesions

Type	No. of cases	Percentage
Osteogenic sarcoma	5	16.6
Giant cell tumour	5	16.6
Chondrosarcoma	1	3.3
Osteochodroma	2	6.6
Ewing's sarcoma	5	16.6
Reticular cell sarcoma	2	6.6
Osteod-osteoma	2	6.6
Metastases	3	10
Fibrous dysplasia	1	3.3
Enchondroma	2	6.6
Ameloblastoma	1	3.3
Bone cyst	1	3.3

-Osteogenic sarcoma, giant cell tumour and Ewing sarcoma (50%).
10% of bone tumours were Metastasis.

Fig 1 Ill- Dedined Permeative Lesion Intramedulary Part of Shaft of femur with Laminated Periosteal Reaction- EWING SARCOMA

Fig 2 Ill-dedined expansile Lesion with extensive periosteal reaction with codman triangle- osteosarcoma

Fig 3 Multiple expansile , groung glossing with narrow zone transition- Fibous dysplasia

Fig 4 Well-defined subarticular expansile lesion with narrow zone of transition – Giant cell tumour

Fig 5 Expansile heterogenous mass at proximal part tibia with subarticular location- sarcomatous changes of giant cell tumour

Discussion

Diagnostic radiology has an important role to play in the identification of the lesion in providing its differential diagnosis, establishing its anatomic extent and often if not always, providing a definitive diagnosis, subject to, of course, a histopahtological confirmation.

Truly, though, malignant tumours arising from skeletal system are rather rare. They represent just about 0.2% of all primary cancers and 6% of all cancers under the age of 14 years(3). It is much established fact that the primary skeletal tumours tend to most commonly affect adolescent and young adults(7). Both benign and malignant tumours occur more abundantly in the second and third decades of life, and it is only metastases and multiple myeloma which occur mostly in the later years, often after the age of 50(7). The findings of this study were at no variance 43% of our patients with bone tumours were in their second or third decade.

Even though available literature suggests that these tumours show no sex prediction, the present study found a definite males bias (56.6%) skeletal tumours may present themselves in protean ways. But the commonest presentation is pain and (or) swelling in the affected part (4). 90% of our patients presented both pain and swelling.

A good radiographic evaluation of musculoskeletal tumours sets out to achieve two primary goals: One, to establish diagnosis and two, to make an accurate assessment of the extent of intra and extra-asseous spread of the tumours.[9]

Plain skiagrams in multiple projections are extremely accurate and form an important first line of investigation.[16]. In the present study, plain skiagrams provided accurate diagnosis in 96.6% of bone tumours.

Advantages

The main advantages of radiography over CT include affordability, accessibility and a concise method by which to assess the lesion on a limited number of images.

Pitfalls

Anatomic overlap results obscuration of abnormalities and a limited soft tissue evaluation capacity. Limited for determining the degree of extraosseous tumor volume, relationship of extraosseous tumor to surrounding structures, and extent of involvement of marrow cavity. MRI is the modality of choice for simultaneously evaluating these relationships. MRI has lower sensitivity for the detection of mineralized matrix when compared with CT or for the detection of undisplaced fracture when compared with CT or MRI.

Summary

1) An extensive study of 30 patients with clinical suspicion of skeletal tumours was conducted.
2) Though, the age of these patients ranged from 2 years to 82 years, the modal decade was the third decade.
3) The study showed a distinct male preponderance with male female ratio being 3:2.
4) 56.6% of bone tumours involved appendicular skeleton, which, femur was involved in 30% of cases.
5) Bone tumours were staged according to Enneking system 83.3% of our patients with bone tumours in stage $II_{B.}$

Conclusions

Radiography is the single most helpful imaging modality when establishing the initial differential diagnosis of primary bone tumors. Evaluation of the margins/zone of transition is the greatest contributing factor to radiographic assessment of the nature of the lesions. Other features, such as cortical expansion, cortical destruction and periosteal reaction, provide additive clues diagnosis. Although MRI and CT provide superior soft-tissue assessment and are free from structural overlap, the unique information afforded by radiography is optimal for the efficient formation of an initial differential diagnosis of primary bone tumors

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