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Original Research Article

Retrospective Study of Cases of Osteomyelitis On The Basis Of X- Ray, CT scan and MR Imaging Modalities (Study of 50 Cases - Observed During The Period of Aug-15 To Feb-16)

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Abstract: Osteomyelitisis infection and inflammation of the bone and bone marrow. The objectives are to study the prevalence of osteomyelitis in different age groups, to evaluate the X-ray, CT scan & MR imaging spectrum of osteomyelitis &to evaluate current role of CT &MRI modalities in the cases of osteomyelitis. We have reviewed X-rays, CT scans & MRI of all the patients diagnosed as osteomyelitis from Aug.15 to Feb.16 (50 patients) in our tertiary care centre; out of the 50 cases highest number of cases found of age group between 11-20yrs, male predominance& disco-vertebral involvement is more common. Sensitivity of MR imaging is 100% &of X-ray &CT scan is upto max. 92%.Radiological imaging techniques play a key role in early diagnosis, treatment & follow up of the cases of osteomyelitis from which MR imaging is the most sensitive and specific modality& modality of choice nowadays.
Keywords: Osteomyelitis, OM, Spondylodiscitis, CT &MRI in OM.

INTRODUCTION:

Osteomyelitis (OM) is infection and inflammation of bone and bone marrow. Posttraumatic osteomyelitis accounts for as many as 47% of cases of osteomyelitis. Other major causes of osteomyelitis include vascular insufficiency (mostly occurring in persons with diabetes; 34%) and haematogenous seeding (19%).Bone is normally resistant to infection but trauma, bacteraemia, surgery or foreign body may disrupts and lead to the onset of osteomyelitis [1]. Its manifestations are heterogeneous, depending upon the age of the patient, specific causative organisms, systemic and local host factors as well as presence of underlying co-morbidity [2]. Imaging techniques play a key role in early diagnosis & follow up. Conventional radiography is first imaging modality to start. CT can be useful method to detect early osseous erosions and document the presence of sequestrations, foreign body or gas formation but it is less sensitive for the detection of bone infection. MRI is the most sensitive and specific imaging modalities for the detection of osteomyelitis and provides excellent anatomic details & more accurate information about the extent of the infectious process and soft tissue involvement.

Aims & Objectives of the study:

- To study the relative prevalence of osteomyelitis in different age groups
- To evaluate the X-ray, CT scan & MR imaging spectrum of osteomyelitis
- Current role & advantages of CT scan and MRI in evaluation of osteomyelitis

MATERIALS &METHODS:

We have retrospectively reviewed X-rays, CT scans & MR imaging of all the patients diagnosed as osteomyelitis from August 2015 to February 2016 (50 patients) in our tertiary care centre - Department of Radiology, P.D.U. Govt. Medical College & Civil Hospital, Rajkot.. Imaging findings of different

modality were reviewed tabulated and analysed according to the objectives.

Inclusion criteria: All the newly diagnosed cases of osteomyelitis on any of the imaging modality.

Exclusion criteria: Treated cases and bone tumours& tumour like conditions.

RESULTS:

Table-1: Sex distribution

Sex	No. of patients	Percentage
Male	33	66%
Female	17	34%
Total	50	100%

Table-2: Stage wise distribution

Stage	No. of patients	Percentage
Acute	30	60%
Subacute	9	18%
Chronic	11	22%
Total	50	100%

Table-3: Age distribution

Age (years)	No. of cases	Percentage
Below 10	5	10%
11-20	13	26%
21-30	12	24%
31-40	5	10%
41-50	4	8 %
51-60	5	10%
>60	6	12%
Total	50	100%

Table-4: Distribution on the basis of bone involved

Site involved	No. of patient	Percentage
Disco-vertebral	17	34%
Femur	10	20
Tibia	9	18%
Pelvic bones	6	12%
Tarsal bones	3	6%
Humours	2	4%
Metatarsal	1	2%
Radius	1	2%
Ulna	1	2%
Total	50	100%

Table-5: Comparison of the lesions detected on X-ray, CT scan &MRI

Modality	No. of pt with negative findings or normal	No. of pt with Positive findings	Total no. of patients	Sensitivity detected
X-ray	10	40	50	80%
CT scan	4	46	50	92%
MRI	0	50	50	100%

Discussion:

Osteomyelitis is an infection& inflammation of bone and bone marrow. Most commonly it is subdivided into acute, chronic and subacute stages. Many other classifications were also proposed.

Classification systems:

- **Waldvogel** *et al* proposed a staging system based on the infection's pathogenesis, dividing into three categories like haematogenous, secondary to the contiguous foci of infection& associated with vascular insufficiency [3].
- **Cierny & Mader** Staging for Osteomyelitis [4-6].

Anatomic type		**Physiologic class**	
Stage 1	Medullary osteomyelitis	A host	Normal
Stage 2	Superficial osteomyelitis	B host	Systemic compromise (Bs)
Stage 3	Localized osteomyelitis	B host	Systemic & local compromise (Bls)
Stage 4	Diffuse osteomyelitis	C host	Treatment worst than disease

Systemic or local factors that affect immune surveillance, metabolism and vascularity

Systemic (Bs)		**Local (Bl)**	
Malnutrition	Renal or Hepatic failure	Chronic lymphedema	Vacuities
Diabetes mellitus	Malignancy	Major Vessel compromise	venous stasis
Immune disease	Extremes of age	Small vessels compromise	Neuropathy
Tobacco abuse	Radiation fibrosis		

Diagnosis of Acute Osteomyelitis [7] is most commonly required & can be done by one or combination of the following: Pus on aspiration, Positive bacterial culture from bone or blood, Presence of classic signs and symptoms of acute osteomyelitis & Radiographic changes typical of osteomyelitis – which are: Two of the listed findings must be present for establishment of the diagnosis on X-ray like early bony changes include: periosteal thickening, lytic lesions, endosteal scalloping, osteopenia, loss of trabecular architecture, and new bone apposition [8].

Role of MRI: MRI has multiplanner capabilities, so it provides better anatomic details & better soft tissue resolution. Marrow signal abnormality is more sensitive on MRI than lytic changes. Findings: In Acute stage: T1WI showlow signal intensity medullary space, T2WI show high signal intensity surrounding inflammatory processes-oedema& post gadolinium images show enhancement ofthe area of necrosis.In Subacute stage: T1WI - central abscess cavity with low signal intensity, T2WI - high signal intensity of granulation tissue surrounded by low signal intensity band of bone sclerosis (double line effect).Evidence of Brodie's abscess, single or multiple radiolucent abscesses. In Chronic stage: T1W &T2WI - low signal intensity areas of devascularized fibrotic scarring in the marrow. Limitations of the MRI modality are: It has limited availability and relatively expensive. It contraindicated in patients with implant devices and metallic clips. It is not tolerated by all the patients, claustrophobic, morbidly obese and young children may require sedation. Patient motion may degrade the images. Similar changes can be occur in tumour, fractures & varieties of intramedullary and juxtamedullary processes may cause bone marrow oedema and may mimic osteomyelitis.

Role of CTscan: It has an excellent spatial resolution and sensitive for osteolytic lesion.

Findings: Early finding are same as described above in X-ray but here we can see them in detail. On gradually increasing the severity of the disease we can see increased density of fatty marrow, periosteal reaction, cortical erosion or destruction, sequestra, involucrum, intraosseous gas, elevated periosteum. Main limitations of the modality are: Costly and not readily available, radiation exposure & insufficient for the assessment of detail activity of the disease process& extension including soft tissue involvement [6].

CONCLUSION:

Imaging techniques play a key role in early diagnosis, treatment& follow up of osteomyelitis. X-ray remains first, easiest & cheapest modality of choice in any of the suspected case. CT scan can be useful method to detect early osseous erosions &document the

presence of sequestrations, foreign body or gas formation, but it is less sensitive than MRI and disadvantage of ionizing radiation. MRI provides excellent anatomic details & more accurate information about the extent of the infectious process and soft tissue involvement but availability and its cost are the main limiting factors in both – CT scan & MRI modalities. MRI is more specific and sensitive in detection of changes of osteomyelitis than CT scan. So according to the observations, current trends are increasing towards the perfect diagnosis & extent of osteomyelitis by doing use of MR imaging modality & if above mentioned limiting factors are no major concern than we must prefer the MR imaging modality for detail evaluation of suspected cases of osteomyelitis.

(1) Imaging:

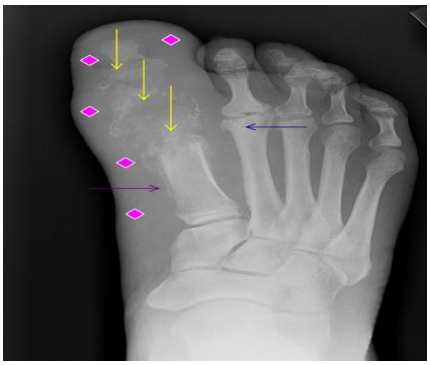

Fig.1: X-ray foot AP view shows:
Marked bone lysis(→) of the 1st metatarsal, 1st proximal phalanx and 1st distal phalanx noted.Mild cortical lucency and sclerosis(→) of the medial aspect of the distal 2nd metatarsal.Marked soft tissue swelling(◆) along the medial foot and surrounding the 1st toe joints. Solid periosteal reaction(→)of the 1st metatarsal.

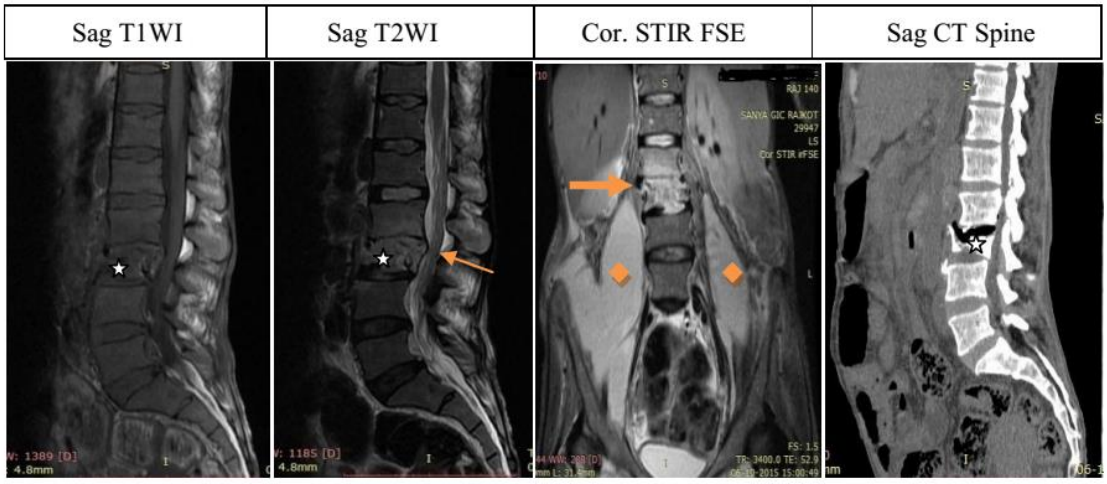

Fig. 2: MRI & CT scan images of LS Spine:Above images are of patient with acute disco-vertebral osteomyelitis. L2,L3 &L4 vertebral bodies and intervening discs show altered marrow intensities, which demonstrate hypointense signal on T1W images and heterogeneously hyperintense signal on T2W and STIR images (☆). There is marked erosion with intra osseous gas formation (→) noted involving L3 vertebral body with resultant wedging, collapsed and retropulsion(→) appreciated on both CT and MR images. B/L

REFE

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