Skeletal Manifestations and Role of Dexa Study in 32 Patients with Multiple Myeloma

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ABSTRACT:

AIM OF THE STUDY :

To discuss skeletal manifestation of patients with multiple myeloma &the role of double energy X-ray photometry study in the management of those patients .

PATIENTS & METHODS:

During period from the 1st of April 2004 to 1st of January 2005 we collected 32 patients who fulfilled the criteria of diagnosis of multiple myeloma. .All our patients have detailed history & physical examination including: Age, Sex, Bone pain, pathological fracture, Localized tenderness & Bone swelling

RESULTS:

Pathological fracture found in (14) (43.75%), (10) were males (50%) of total males & (4) were females (33.3%) of total females.Serum Alkaline Phosphatase ranging between (30-135KAU\L), mean (75.218KAU\L), patients who got serum alkaline phosphatase level>80 KAU\L are(13)(40.62%),(11)(84.6%) of them got localized tenderness &(11) (84.6%) of them got pathological fracture ,but those who got serum alkaline phosphatase >100KAU|L all of them got pathological fracture. DEXA study found to be significant in (24) (75%) & insignificant in (8) (25%).All the studied patients with pathological fracture got significant DEXA.

Significant DEXA found in (12) (75%) of patients with positive skull X-ray, (17)(80.9%) with a positive spine X-ray,(10) (71.42%) with apositive pelvic X-ray &(8) (80%) with apositive longe bone X-ray. Significant DEXA found in (11) (91.66%) patients with S.Calcium >2.6mmol\L & those who got S.Calcium >3.3 mmol\Lall got significant DEXA.

DISCUSSION & CONCLUSIONS:

The most common presenting feature is bone pain.

Pathological fractures were more common in males than females, all patients with serum alkaline phosphatase >100KAU\L got pathological fractures & there is no relationship between localized tenderness &pathological fracture. here is no patient with pathological fracture with insignificant DEXA. The more advanced changes in DEXA study had higher risk of pathological fracture & needed close observations &treatment to improve bone

T condition.

KEY WORDS:DEXA:double energy X-ray absorbometry,multiple myeloma,lytic bone lesion.

INTRODUCTION:

Definition :Plasmocytic myeloma, plasma cell myeloma ,myelomatosis refers to a malignant disease of plasma cell resulting from neoplastic proliferation of monoclonal plasma cells engaged in production of monoclonal immunoglobulin this will lead to bone damage and bone pain, but often involve other tissue as well.(1) (2).It represents one of the commoner hematological malignancies and the commonest primary malignant bone tumor (3).

Historical review :

The first patient known to have multiple myeloma was Thomas Alexander McBean who was Seen in 1845 .(4) In 1846 , the first case of myeloma was described by dalyrymple

Incidence&aetiology of multiple yeloma

The mean age of diagnosis of patient with multiple myeloma is 68 years.(7) Men more frequently affected than women. (10)

Clinical manifestations:

The clinical presentations of patients with multiple myeloma seems to be changing, probably as a result of diagnostic services that detect the disease at early stage (14) The prominent symptoms resulting from monoclonal protein secretion and from abnormal plasma cells accumulation in the marrow space which compromises both bone trabiculae and normal hemopoietic cells.30% of cases detected during evaluation of seemingly unrelated problems. (14) .

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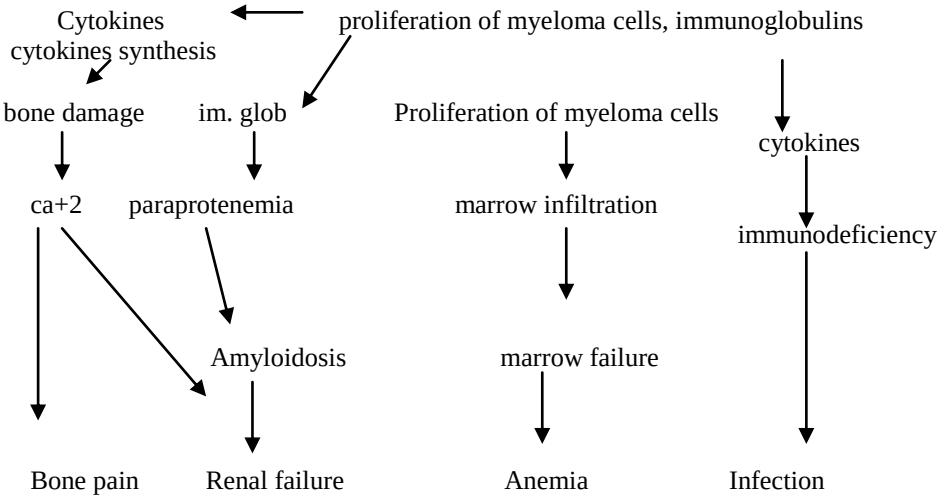
1.6: Mechanism of underlying clinical features of myeloma



IMAGING FINDINGS

1.Conventional X-ray findings***:*** Some 60% of myeloma patients have skeletal lytic lesion, with or without osteoporosis.Some 20% of patients have osteoporosis alone, 15-20% of patients have diffuse bone marrow infiltration with few or no lytic lesions. [21]and few patients have. osteoclastic bone lesion.

2.DEXA (Double Energy X-ray Absorbometry):Bone densimetry is an instrument used to detect the mineral bone density expressed in gm\m^2.[27]It s work depends up on the attenuation of the beam of energy as it pass through the bone and soft tissue. [28]It was introduced in 1987.DEXA in comparison to dual energy photon absorbometry, it is less coasty, less hazards of radiation and quicker.The advantage of X-ray on radioisotope is greater intensity, greater improvement in precision and accuracy. [29].DEXA can measure mineral density both in peripheral and axial skeleton, as well as total body scan.It use a small dose of radiation which need no protection to the examiner and the patient (0.5 – 5) microsieverts.In comparison to CT it is cheap and less exposure to radiation& more accurate in diagnosis of bone loosening disease. In DEXA we got two scores.

1- Z score: compare the mineral bone density of the patient with a standard of the same age group (obliteration of age factor).(Patients results subtracted from mean value of age control) / Standard deviation.So it is zero for normal population described as standard deviation.

2- T score: comparing mineral bone density of young peoples with the same sex&gender, it is described as standard deviation.T score used to diagnose osteoporosis.For young adult *****one standard deviation is normal (-1).*osteopenia if< -1 standard deviation but not<-2.5 *if <-2.5 standard deviation (sever osteoporosis with high incidence of pathological fracture. (51)

3.CT(Computerised axial tommography):

Detects osseous involvement myeloma but it is not superior to traditional x- ray study

4.MRI(Magnetic resonance imaging);

3 patterns of MRI findings may be found [31, 32, 33]..Focal,diffuse and variegated pattern.

Laboratory Investigtions :Ninety percent of patient got high serum and urine monoclonal immunoglobulin.[39][40]Infiltration of the bone marrow with abnormal plasma cells usually above 10% of nucleated elements .[41]Anemia[42]Renalimpairment.[39]Hypercalcaemia.,[43] Serum alkaline phosphates usually normal and increase only in pathological fracture. (44)ESR usually above 100 mm\hour.(43)

PATIENTS &METHODS :

32 patients were recruited from hematological unit– Baghdad Teaching Hospital, fom period from the first of April 2004 to the first of January 2005. They were eligible if they fulfilled criteria of diagnosis of multiple myeloma excluding patients with abnormal renal function. All patients had detailed history and detailed

physical examination.Investigations done including aspirates & biopsy ,Serum protein electrophoresis.- Blood biochemistry- Urine examination for Bence Jones protein. -Skeletal survey:DEXA study done in X-ray institute –Medical City. Instrument name DPX-NT \ GERMANY According to Bacovsky.J definition of osteoporosis & osteopenia (49), we divided the results of Z –score of our patients to significant & insignificant results;

1-Insignificant results included:

A-Normal DEXA study (0 to- 0.5) SD.

B-osteopenia (-0.6 to -1) SD .

C- Mild osteoporosis (-1.1 to -1.5) SD.

2-Significant results included:

A-Moderate osteoporosis (-1.6 to -2) SD.

B-Severe osteoporosis (-2.1 to -3) SD.

C-Very sever osteoporosis (less than -3) SD .

RESULTS:

We recruited 32 patients, 20 of them (62.5%) were male & 12 (37.5%) were females .The mean age of studied group was (52..06 + - 12.1) years, rang between 32 -70 years. All our patients were having bone pain but (26) of them (81.25%) were having localized tenderness on examination .Bone swellings were found in (8) patients (25%) of the studied group distributed in the following Sites: Ribs (2) patients (25%), Long bones (4) patients (50%), Pelvis (2) patients (25%),Pathological fracture found in (14) patients (43.75%), (10)(71.42) of them were males representing (50%) of total males in the studied group & (4) (28.5%) of them were females, which represent (33.3%) of total females in the group. Pathological fracture distributed as follow: 1-Compressed vertebral fracture (6) patients (42.85%).2. Fracture neck of femur (4) patients (28.57%). 3. Fracture of long bones (2) patients (14.28%).4. Fracture ribs (2) patients (14.28%).Localized tenderness found to be positive in (26) patients (81.25%), (12) of them (46.15%) got pathological fracture. ESR found to be elevated in all our patients > 50 mm\hour, mean values (112.62mm\hour).Serum protein electrophoresis: mono clonal M-band was found in (30) patients (93.75%) of the studied group.Serum Calcium found to be ranging between 2.1mmol\L to 3.5 mmol\LMean =2.62 mmol\L, (12) (37.5%) of them found to have serum Calcium >2.6mmol\L after correction according to serum albumin, & (5) (15.62%)of them found to have serum Calcium >3mmol \L. Serum alkaline phosphatase found to be ranging between 30 KAU\L to 135KAU\L, mean (75.218 KAU\L)Those who got high serum alkaline phosphatase above 80 KAU\L are (13) (40.62%), (11) of them (84.6%) got localized Complete blood picture & ESR. Bone marrow tenderness & (11) of them got pathological fracture (84.6%), those who got serum alkaline phosphatase above 100 KAU\L all of them got pathological fracture. Abnormal radiological findings:1. Skull X –ray found to be positive in (16) patients (50%). 2. Chest X-ray found to be positive in (6) patients (18.75) all of them were males.3. Spine X-ray found to be positive in (21) patients (65.62%). 4. Pelvic X-ray found to be positive in (14) patients (43.75%). 5. Long bone X-ray found to be positive in (10) patients of the studied group (31.25%).

DEXA findings:Significant DEXA findings in (24) patients (75%) & insignificant in (8) patients (25%).Significant DEXA found in all patients with pathological fracture and no patients with insignificant DEXA had pathological fracture. Graph No.(1)Significant DEXA found (12) (75%) patients with positive skull X-ray findings & insignificant in (4) (25%) patients with positive skull X-ray findings.Significant DEXA found in (17)(80.9%) patients with positive spine X-ray &insignificant in (4) (19.04%) patients.

Graph No.(2)Significant DEXA in (10) (71.42%) patients with positive pelvic X- ray findings while (4) (28.57%) patients with positive pelvic X-ray have insignificant DEXA. Significant DEXA found in (8) (80%) patients with positive long bone X-ray insignificant in (2) (20%).

Graph No.(3)(11) of patients with S.Calcium > 2.6 mmol\L got significant DEXA (91.66%), while only one patient got insignificant DEXA (8.33%).Those who got S .Calcium level > 3.3 mmol\L all of them got significant DEXA.

Graph No.(4)DISCUSSION & CONCLUSSION: .The most common presenting feature in our studied patients was pain which was seen in (100%),compared with another study(50)which showed (78%) of his patients present with bone pain &this is because we collected our patients whom already diagnosed &treated while Abbas used newly diagnosed patients in his study . Pathological fracture more common in male patients,it represents (50%) of total males in comparison to females patients in whom (33.3%)of them got pathological fracture.All our studied patients who got serum alkaline phosphatase (>100KAU\L) got pathological fracture which explain the relation ship between them because serum alkaline phosphatase level increase in the healing stage of pathological fracture.There is no relationship between localized tenderness &pathological fracture, those who got localized tenderness without pathological fracture are more

than those who got pathological fracture, &this give as a clue that localized tenderness is related to disease activity & not to the pathological fracture. We found that significant DEXA is more prevalent in patients with a positive X-ray changes & pathological fracture, make it an important tool for studying disease activity &follow up. Significant DEXA associated with high S.Calcium level which reflects disease activity.

RECOMMENDATIONS:

Although our study is a small study to draw an important conclusions but it suggest that DEXA study is a good tool for knowing the state of bone in patients with multiple myeloma & it gives some hints to which patient at risk to develop pathological fracture who definitely need bisphosphonates.

So our recommendation is to do the study (DEXA) initially at diagnosis of the disease & every three months as follow up during treatment.

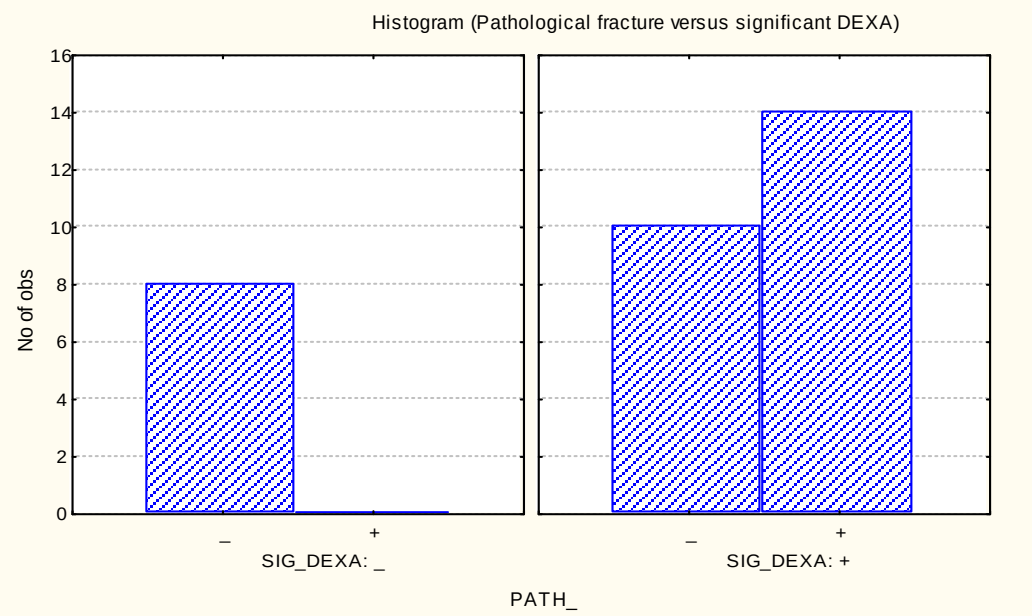


Figure 1

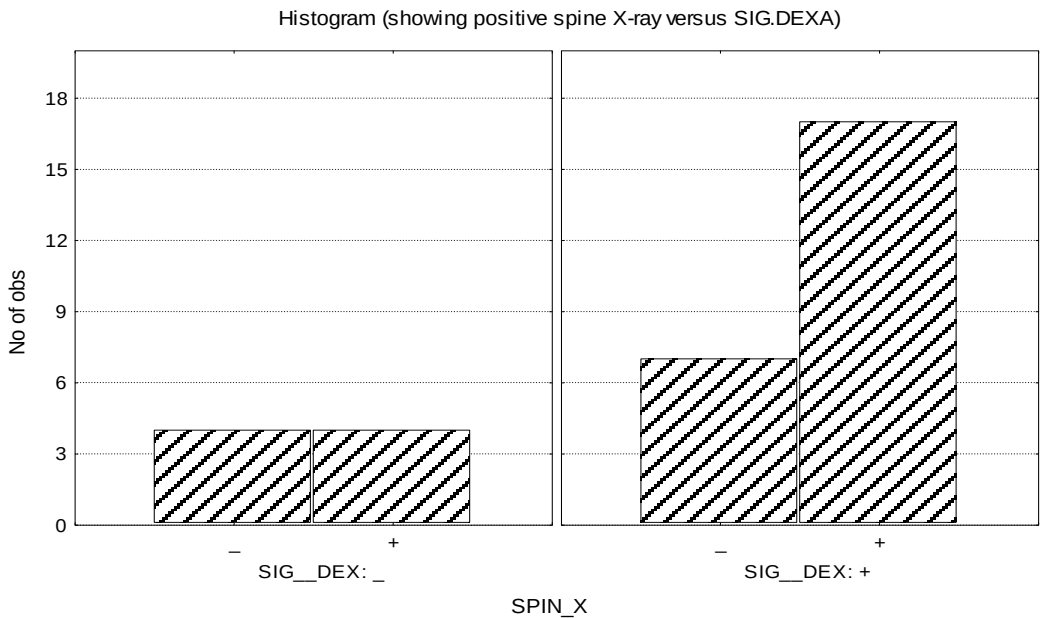


Figure 2

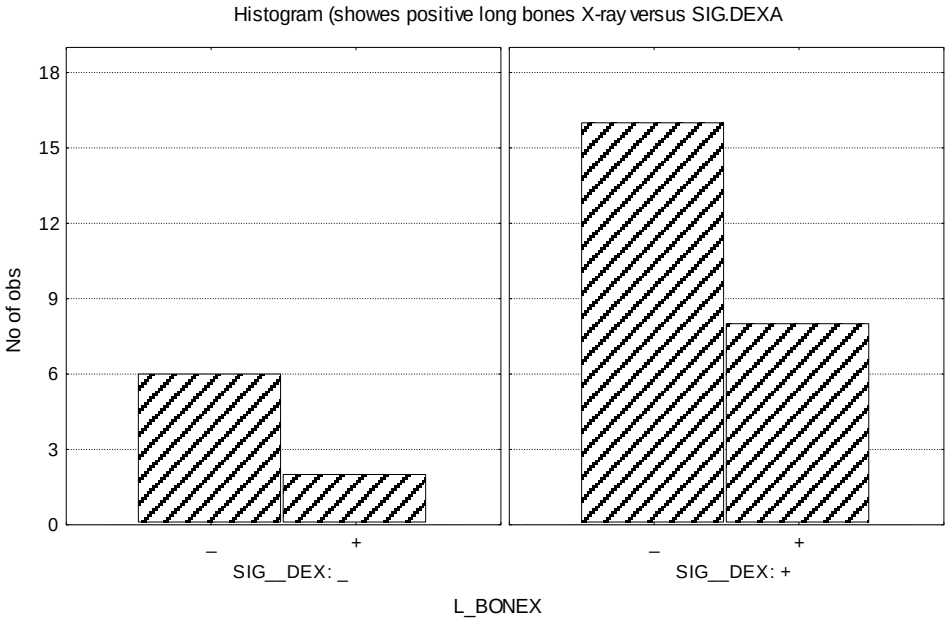


Figure 3

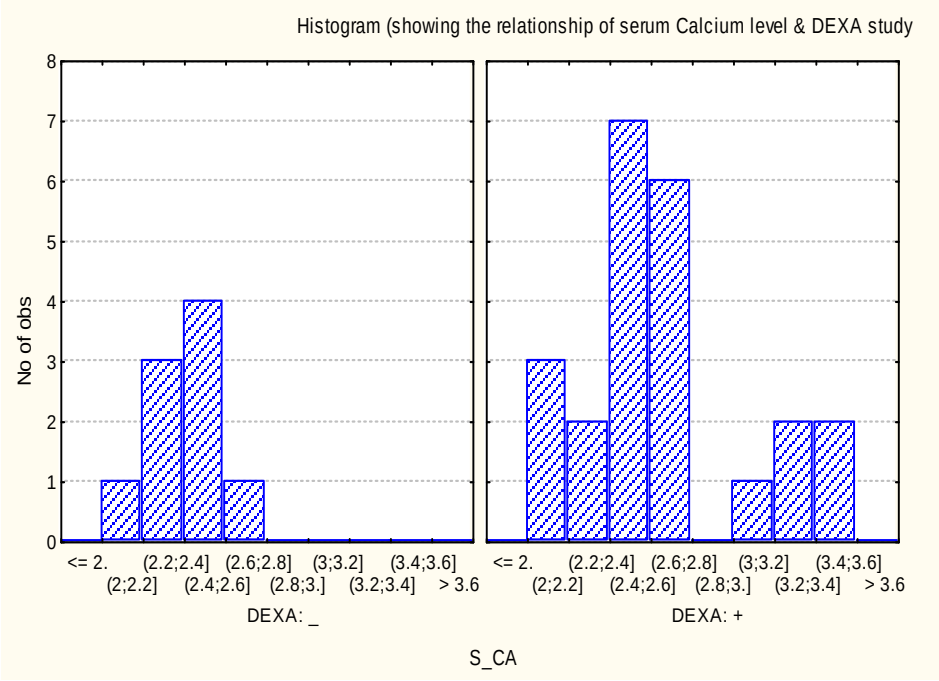


Figure 4

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