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Pathological fracture due to malignant neoplasm

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Abstract---Pathological fractures can be caused by any type of bone tumor, but the majority of pathologic fractures in the elderly are secondary to metastatic carcinomas. Multiple myeloma is also common in the elderly and has a high incidence of pathologic fractures. The surgical treatment of impending or pathologic fracture are to provide pain relief and a functionally stable and durable construct that will allow the patient to ambulate shortly after surgery. Fixation of metastatic pathologic fractures requires reinforcement or replacement of the compromised bone with a rigid and durable construct. Aim of the study-is to evaluate pathological fracture in metastatic disease of bone fromdifferent type of malignancy. Material and methods-This is a retrospective analysis of 50 patients of histopathologically proven metastatic bone disease, evaluated for pathological fracture in Mahavir Cancer Sansthan during 2014-2016. Results-Out of 50 patients of metastatic bone disease 13 (26%) patients had pathological fracture. Maximum numbers of patients 6(46.1%) belongs to age range of 50-59 years. Out of 13 patients, 7(53.8%) were male 6(46.1%) patients were female. Pathological fracture was seen in 3(23%) patients of prostate cancer and 3(23%) patients of cervical cancer,2(15.3%) patients of breast cancer and 2(15.3%) patients of multiple myeloma.1(7.6%) patients of oropharynx cancer, 1(7.6%) of rectum,1(7.6%) of malignant giant cell tumor. Majority of patients 3(23%) had fracture at neck of femur and 3(23%) had vertebral fracture,other site were 1(7.6%) patient of each pubic rami, 1(7.6%) femur subtrochanteric,1(7.6%) shaft of femur,1(7.6%)humerus proximal end,1(7.6%) shaft of humerus,1(7.6%) elbowjoint,1(7.6%) wrist joint. Out of 13 patients 9(69.2%) patients underwent internal fixation followed by radiotherapy and 4(30.7%) patient underwent only radiation.

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Conclusion: Internal fixation of metastatic pathologic fractures using a locking plate in the lower extremity can be an effective treatment option in the meta- or diaphyseal area of long bones with massive bony destruction or poor bone stock by offering early ambulation, pain relief and low postoperative complication.

Keywords---pathological fracture, metastatic bone disease, internal fixation.

Introduction

The term pathologic fracture refers to the fracture that occurs in the area of a neoplasm. Pathologic fractures can be caused by any types of bone tumors. In elderly metastatic bone disease are very common. Multiple myeloma is also common in the elderly and has a high incidence of pathologic fractures. The most common primary malignancies that metastasize to bone are breast, lung, kidney, prostate, and thyroid carcinomas, which account for approximately700,000 new primary cases in the U.S.(Campanacci,1999) annually. Metastatic bone disease can have very detrimental effects on quality of life. The prognosis for patients with metastasis to bone largely depends on the aggressiveness of the primary tumor. The axial skeleton is the third most common site of bony metastasis, after the lung and liver. Metastatic disease to the axial skeleton occurs much more frequently in the spine, pelvis, ribs, and lower extremities, humerus. In multiple myeloma, the majority of patients have pathological fractures at the time of diagnosis, and up to 30% of patients present with non-vertebral fractures (Croucher ,1998) Metastasis to the long bones usually reflects an advanced disease status. Metastatic spine tumors are 40 times more frequent than all primary bone tumors combined (Harrington KD.1988).

In autopsy series, vertebral body meta states were found in over one-third of patients who died of cancer (Wong DA, 1990). The anterior elements of the spine are 20 times more likely to be involved than the posterior elements (Brihaye J,1988)A pathologic fracture can be devastating in an elderly cancer patient and is a clear indication for surgical intervention, with the patient's medical condition and expected survival are important in the decision for surgery. The treatment of metastatic bone lesions in the absence of fracture is not so well-defined. Because pathologic fractures are extremely detrimental, prophylactic surgical treatment of impending fractures has been shown to improve outcomes (Ward WG,2003). In 1989, Mirels developed a scoring system designed to predict the risk of pathologic fracture due to bone metastases in the extremities. The Mirels classification is based on the degree of pain, lesion size, lytic versus blastic nature, and anatomic location. Mireles recommended prophylactic fixation for a total score> 9.

Mirel'sscoring system

	1	2	3
Pain	mild	moderate	Mechanical pain
Lesion size	<1/3	1/3-2/3	>2/3
Lesion type	blastic	mixed	lytic

Anatomic site	Upper limb	Lower limb	Peri trochanteric

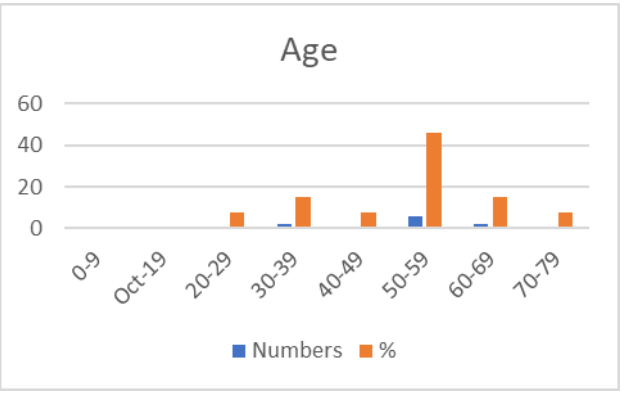
The goals of surgery for impending or pathologic fracture in the setting of metastatic disease are to provide pain relief and a functionally stable and durable construct that will allow the patient to ambulate shortly after surgery and will persist for the life of the patient. The techniques used in patients with pathological fractures differ from those used in young patients with traumatic fractures in which fixation is placed as a temporary stabilizing measure while fracture healing occurs. The idea in the fixation of metastatic pathologic fractures is to reinforce replace the compromised bone with a rigid and durable construct. This typically requires plates or intramedullary rods with the addition of methyl methacrylate, or bone cement, to fill the bone defects. One study followed 165 multiple myeloma patients for an average of 3.2 years and found approximately two pathologic fractures, mostly vertebral and rib fracture, per patient (Melton LJ,2005).

Material and Methods

This study is retrospective analysis of 50 patients of metastatic bone disease, evaluated for pathological fracture in Mahavir cancer sansthan during 2014 to 2016 which was approved by their ethical committee. Total of 13 patients were diagnosed as pathological fracture. All patients were examined clinically, underwent laboratory investigation, imaging like X-ray, computerized tomography of painful site, bone scan of whole body. Patients having pathological fracture were analysed for age, sex, site of primary, histopathology, site of fracture, treatment taken.

Results

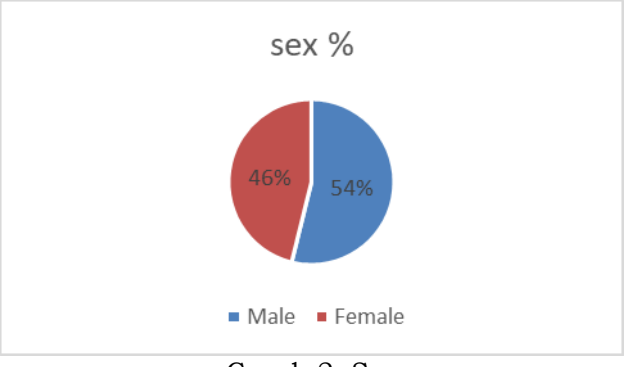
Out of 50 patients of metastatic bone disease 13 (26%) patients had pathological fracture. Maximum numbers of patients 6(46.1%) belongs to age range of 50-59 years. Out of 13 patients, 7(53.8%) were male 6(46.1%) patients were female. Pathological fracture was seen in 3(23%) patients of prostate cancer and 3(23%) patients of cervical cancer,2(15.3%) patients of breast cancer and 2(15.3%) patients of multiple myeloma.1 (7.6%) patients of oropharynxcancer,1(7.6%) of rectum,1(7.6%) of malignant giant cell tumor. Majority of patients 3(23%) had fracture at neck of femur and 3(23%) had vertebral fracture, other site were 1(7.6%) patient of each pubic rami, 1(7.6%)femur subtrochanteric,1(7.6%) shaft of femur,1(7.6%)humerus proximal end,1(7.6%) shaft of humerus,1(7.6%) elbow joint, 1(7.6%) wrist joint. Out of 13 patients 9(69.2%) patients underwent internal fixation followed by radiotherapy and 4(30.7%) patients underwent only radiation.



Graph 1. Age

Table 1
Age

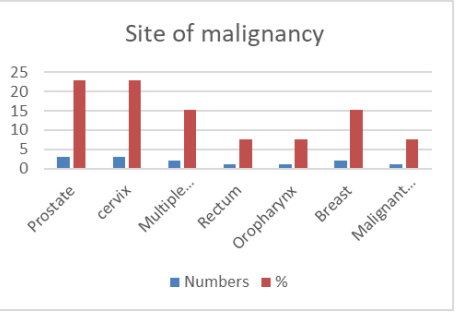
Age range	Numbers	%
0-9	0	0
10-19	0	0
20-29	1	7.6
30-39	2	15.3
40-49	1	7.6
50-59	6	46.1
60-69	2	15.3
70-79	1	7.6



Graph 2. Sex

Table 2
Sex

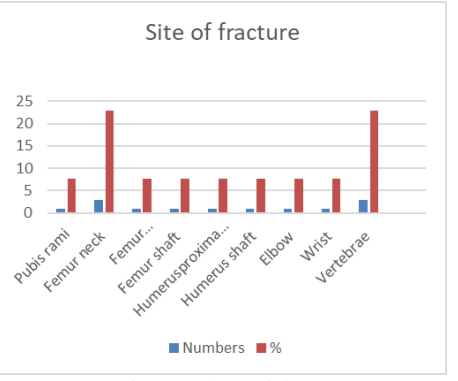
	Numbers	%
Male	7	53.8
Female	6	46.1



Graph 3. Site of malignancy

Table 3
Site of malignancy

	Numbers	%
Prostate	3	23
cervix	3	23
Multiple myeloma	2	15.3
Rectum	1	7.6
Oropharynx	1	7.6
Breast	2	15.3
Malignant GCT	1	7.6

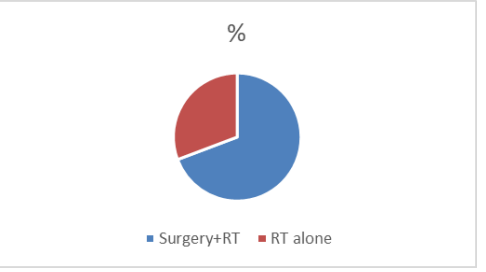


Graph 4. Site of fracture

Table 4
Site of fracture

	Numbers	%
Pubis rami	1	7.6
Femur neck	3	23
Femur subtrochanteric	1	7.6
Femur shaft	1	7.6
Humerusproximal end	1	7.6
Humerus shaft	1	7.6
Elbow	1	7.6

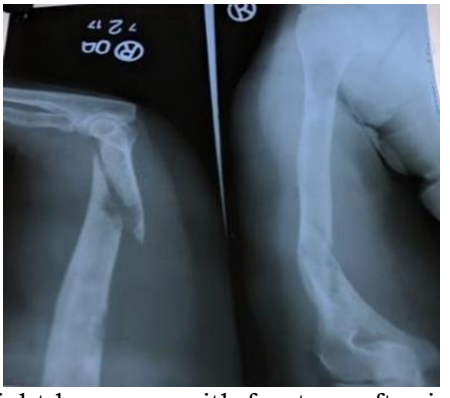
Wrist	1	7.6
Vertebrae	3	23



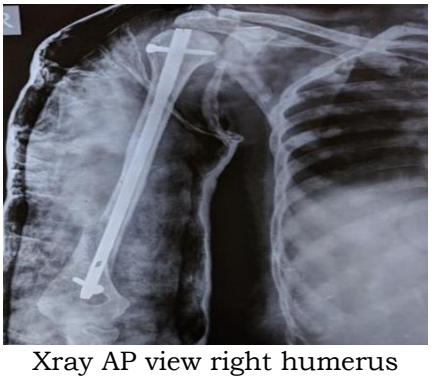
Graph 5. Treatment of patients

Table 5
Treatment of patients

	Numbers	%
Surgery+RT	9	69.2
RT alone	4	30.7



Xray AP view right humerus with fracture after internal fixation

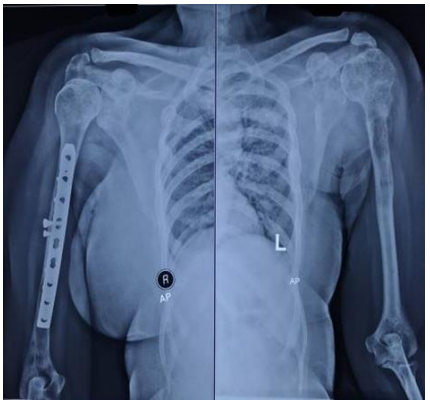


Xray AP view right humerus

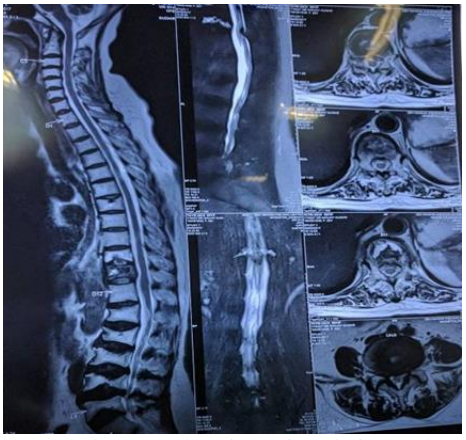
Xray AP view left femur after internal fixation

Xray AP view left femur with trochanteric fracture

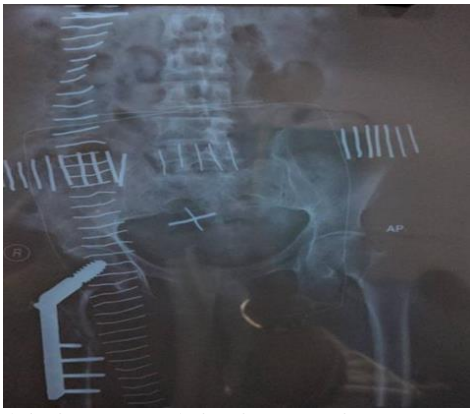
Xray AP view right humerus with fracture



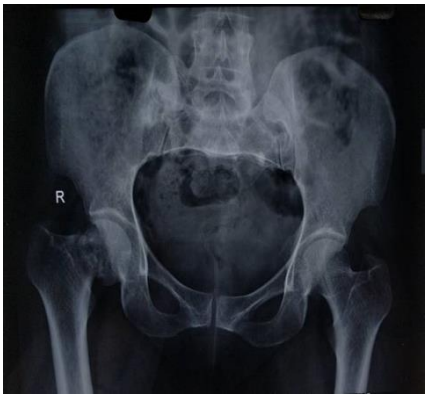
Xray AP view right humerus after locking plate



MRI spine sagittal and axial section



Xray AP view pelvis with fracture right femur after open reduction and locking plate



X-ray pelvis with fracture rt. side neck of femur

Xray pelvis after prosthesis

Discussion

Skeletal metastases are the results of hematogenous disseminations of cancer cells and a complex multistep process which involves interactions between tumor cells and normal host cells.(Kay PR 1989,Mercadante S1997) Incidences between 25 and 100% have been reported for bony metastases in advanced myeloma and carcinomas of the breast, prostate, thyroid, lung and kidney (Mundy GR.1997)and although the incidence of a pathological long bone fracture in patients with metastatic bone disease is uncertain, but may be about10%.According to another author pathological fracture in bony metastasis varies from 10-29% (Buggay D 2003.& Coleman RE1997). In our present study out of 50 patients of metastatic bone disease 13 (26%) patients had pathological fracture.

Maximum numbers of patients 6(46.1%) belongs to age range of 50-59 years. This study was very close to other study (Douglas Kenji et al 2006)in which maximum pathological fracture was seen in 5thdecade.Out of 13 patients of pathological fracture, 7(53.8%) were male 6(46.1%) patients were female. Metastatic disease is the main cause of death among cancer patients, the third most common site of metastases being the bone, after liver and lungs. Breast, lung, thyroid, prostate, and kidney tumors are most likely to metastasize to bone. Approximately 50% of all patients dying from cancer have bone metastases (SwansonKC 2000). In our

study pathological fracture was seen in 3(23%) patients of prostate cancer and 3(23%) patients of cervical cancer,2(15.3%) patients of breast cancer and 2(15.3%) patients of multiple myeloma.1(7.6%) patients of oropharynx cancer,1 (7.6%) of rectum,1(7.6%) of malignant giant cell tumor.

The most affected site in the patients treated in most study were the lower limbs (47%), more specifically the femur, and this differs from most reported studies (Reich CD2003, Cheng EY2003). In our study majority of patients 3(23%) had fracture at neck of femur and 3(23%) had vertebral fracture, other site were 1(7.6%) patient of each pubic rami,1(7.6%) femur subtrochanteric ,1(7.6%) shaft of femur,1(7.6%) humerus proximal end,1(7.6%) shaft of humerus,1(7.6%) elbow joint, 1(7.6%) wrist joint. Metastatic destruction of long bones reduces bone load-bearing abilities, and result in pain, impaired mobility, hypercalcemia, and pathological fracture, which cause greatest disability. In cases with an impending or actual pathologic fracture of a long bone by metastatic cancer, the aim of surgical therapy, is to improve the quality of remaining life with respect to pain relief, preserving the function of the affected skeletal component, preventing complications, shortening the time spent in hospital, and to facilitate patient care (Friedl W1990, Graupe F,1996). Out of 13 patients 9 (69.2%) patients underwent internal fixation followed by radiotherapy and 4(30.7%) patients underwent only radiation.

Conclusion

Internal fixation of metastatic pathologic fractures using a locking plate in the lower extremity can be an effective treatment option in the meta- or diaphyseal area of long bones with massive bony destruction or poor bone stock by offering early ambulation, pain relief and low postoperative complication.

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