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CLINICAL ANALYSIS OF PATHOLOGICAL FRACTURE

Orthopedics

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ABSTRACT

Background and objectives: Eighteen cases of pathological fractures were diagnosed and treated appropriately at Tirtiary care hospital, surat. The study period was from September 2016 to July 2018. The cases were followed up for a period ranging from 2-5 months.

Method: 18 cases of pathological fractures were included in this study. The age of the patients ranged from 9-72 years with most of the cases occurring above the age of 45 years.

A thorough physical examination along with radiological and laboratory investigations were carried out to find out the cause for the pathological fractures. The initial treatment was generally in the form of bed rest and traction. The final treatment varied with the cause, age of the patient and site of fracture. All cases were followed for a period between 2-5 months.

RESULTS: Osteoporosis was the most common cause of pathological fractures (44.4%) followed by tumors (36.11%). Femur (48.71%) was the most common site and most fractures occurred in the trochanteric region. In 91.5% cases the fractures occurred spontaneously or after a trivial injury. Operative treatment was carried out in 72.2% of patients with incidence of failed fixation in 1 cases.

Interpretation and conclusion: Typically these fractures occur spontaneously or after a trival injury indicating that the pathological process had compromised the strength of the bone. A thorough physical, clinical, radiological and laboratory investigations is required to find the cause of the pathological weakening of the bone. Whatever treatment protocol is followed to treat the pathological fracture, whether operative or conservative a well planned and executed one dramatically improves the patients life and gives a functionally good result. Patients treated by operative means were ambulatory earlier than those by conservative means.

KEYWORDS

Pathological fracture; osteoporosis; tumors.

INTRODUCTION

A pathological fracture is a fracture of an abnormal bone. Typically, the fracture occurs during normal activity or with minor trauma, as the abnormality of the bone reduces the strength of the bone and predisposes it to mechanical failure with minimal stress[1].

A patient who presents with a fracture occurring spontaneously or after minor trauma or who has an unusual fracture pattern, has had several recent fractures, or has a history of primary malignancy should alert the surgeon to the presence of a predisposing pathologic condition.

The pathologic condition may be osteoporosis, osteomalacia, pagets disease, osteopetrosis, osteogenesis imperfecta, fibrous dysplasia, osteomyelitis, primary bone tumor or a metastatic deposit of a carcinoma.

A detailed history, thorough physical examination and proper investigations are required for establishing the diagnosis. The management of such fractures may be dramatically altered by the associated pathological conditions. Initial management, well planned and well executed dramatically improves a patient's life whereas treatment that is not well planned and carried out condemns the patient to far more difficulty[1].

A orthopaedic surgeon needs to work with the patient, radiologist, pathologist, oncologist, and pain management specialist to provide the patient with optimal treatment and the best life possible.

OBJECTIVES

- To know about the common causes of pathological fractures
- To know about the epidemiology of pathological fracture with respect to age, sex, and site.
- To know about the various modes of treatment options available in the management of pathological fractures.

METHODOLOGY

In this prospective study, 18 cases of pathological fractures treated at Tirtiary care hospital, Surat between September 2016 to July 2018 were included after obtaining clearance from Hospital Ethical Committee.

All patients with the following fractures were included in the study.

a. Fractures occurring spontaneously or with trivial trauma
b. Fractures in patients suffering from tumors or tumorous condition.
c. Fractures in patients having hereditary condition like osteogenesis imperfecta etc.
d. Fractures in patients with associated pathological process like infection.
e. Fractures in patients with nutritional deficiency and hormonal imbalance.

All patients were treated as inpatients. Patients with fractures where a clear underlying pathology could not be established, impending pathological fractures were excluded from the study.

For each case, the following particulars have been made available: Name, age, sex, occupation, presenting complaints, duration of signs and symptoms and site of fracture.

Detailed present, past, family and personal history were obtained. General, systemic, and local examination were carried out. Relevant blood and urine investigations were done. X-ray of the affected bone and skeletal survey were done. CT scan was made available whenever necessary. Ultrasonic heel densitometer was carried out when required. Biopsy also was done when required.

Initially the cases were treated with immobilization of the affected limb, traction to the affected limb, analgesics and antibiotics. The final treatment varied with the cause. Immobilization with splints, plaster of Paris, internal fixation, amputation, and disarticulation was carried out where required. Chemotherapy and radiotherapy was given for the tumorous condition at specialized centers.

Table:1 Distribution of pathological fracture in 18 patients of the present study

	No. of cases
Osteoporosis	8
Primary bone tumors	4
Secondary bone tumors	3
Infection	1

Nutritional disorders	1
Congenital disorders	1
Hormonal imbalance	0

Pathological fractures due to senile osteoporosis were found in 7 patients with. Femur in 4 cases, vertebra in 2 cases, humerus in 1 cases. Ultrasonic heel densitometer was used to confirm the diagnosis in all cases. Out of 4 cases in femur, 2 had intertrochanteric fractures, 1 had neck fracture and 1 had fracture shaft femur. All intertrochanteric fractures were treated by dynamic hip screw (DHS) fixation. Thefemoral neck fractures were treated with hemiarthroplasty. Fracture shaft femur was treated with intramedullary nailing. Of the 1 case having pathological fractures in humerus, it was fracture shaft. Fracture shaft humerus underwent dynamic compression plate (DCP) fixation. All the 2 cases of vertebral fractures were involved in the thoraco-lumbar junction. CT scan of the spine was done to rule out spinal cord compromise. All the cases were treated conservatively in the form of bed rest and bracing. All patients having osteoporotic fractures were given calcium and vitamin D supplements in their diet.

Pathological fractures due to disuse osteoporosis occurred in 1 case. This patient had post polio residual paralysis (PPRP) involving the lower limbs with subtrochanteric fracture. Subtrochanteric fracture was treated with DHS fixation. This patient received calcium and vitamin D supplements in their diet.

Pathological fractures due to primary bone tumors were found in 4 patients. Femur in 1 case, tibia in 1 case, humerus in 1 case and vertebrae in 1 case was found to be involved. Multiple myeloma in 1 cases, osteogenic sarcoma in 1 case, giant cell tumor in 1 case, simple bone cyst in 1 case found to be the cause for the fracture. Biopsy was used to confirm the diagnosis. Osteogeneic sarcoma involved the supracondylar region of femur and was treated with an above knee (A/K) amputation. Adamantinoma involved upper 3rd of tibia and was treated with an A/K amputation. Patient with giant cell tumor had involvement in the upper third of tibia and was treated with curettage and bone cement. The case of simple bone cyst underwent curettage and bone grafting. Patient with chondromyxoid fibroma was treated by curettage and fixation with bone cement and rush rods. The case of fracture neck due to multiple myeloma was treated by hemiarthroplasty. Compression fracture of L_1 vertebra due to multiple myeloma was treated conservatively with bed rest and bracing. All cases of primary malignant tumors received adjuvant chemotherapy at specialized centers.

3 cases of pathological fractures due to secondary tumors were studied. Femur was involved in 1 case, vertebrae in 1 case and humerus in the remaining 1 case. Of the 1 case involving the femur, it was fracture shaft femur fracture. Out of 3 cases, carcinoma of breast was primary in 1 case, carcinoma prostate was primary in 1 case, and carcinoma liver was primary in 1 case. The case of fracture shaft femur was treated with IM nailing. One intertrochanteric fracture was treated by IM nailing and the other was treated conservatively. Fracture shaft humerus was treated conservatively with U slab. Pathological fracture in vertebrae was treated conservatively with bed rest. Chemotherapy was given. One case of pathological fracture due to infection was seen in the study. It was due to osteomyelitis and involved shaft of femur. Fracture shaft femur was associated with subcutaneous abscess formation and it was treated with incision and drainage of the abscess and immobilization in an above knee splint.

1 cases of pathological fracture were due to osteomalacia. Patient had fracture neck femur and she was on antiepileptic drug. Fracture neck femur was treated with hemiarthroplasty and the dosage of antiepileptic drugs was reduced. Vitamin D and calcium supplements were included in the diet.

One case of pathological fracture was due to osteogenesis imperfecta. It involved the tibial bone causing it to bow and fracture. It was treated with multiple corticotomies and fixation with a rush nail.

RESULTS

Table : Distribution of the sample by Age and Sex

Age groups (in years)		SEX		Total
		Male	Female	
11-20	No. of cases	1	2	3
21-30	No. of cases	1	-	1
31-40	No. of cases	1	1	2
41-50	No. of cases	2	1	3
51-60	No. of cases	2	2	4
61-70	No. of cases	1	4	5
71-80	No. of cases	0	-	1
Total	No. of cases	8	10	18

CC=0.426; p<0.332 (NS). Chi-square for age alone=16.889; p<0.018 (S)

No significant association was observed between age groups and sex as contingency coefficient revealed a non-significant value (CC=0.426; p<0.332) revealing that pattern of distribution of frequencies of male and female patients was statistically same. However, when age was considered separately, a significant difference was observed between the frequencies of various age groups (c^2=16.889; p<0.018), indicating that maximum frequencies were observed in the age group of 61-70years, followed by 41-50 years and least in the age group of below 10 and 71-80 years.

Table : Descriptive statistics for the ages of male and female patients

Sex	N	Mean	S.D	Min	Max
Male	8	44.00	19.67	5	72
Female	10	50.16	17.54	13	70
Total	18	47.25	18.57	5	72

't'=0.986; p<0.328 (NS)

The mean age of the sample was found to be 47.25+18.57 years. The mean age for males was 44.00+19.67 years. The mean age for females was 50.16+17.54 years. A non-significant difference ('t'=0.986; p<0.328) was observed between male and female patients in their mean ages.

Table : Distribution of the sample by Sex

Sex	Frequency	Percentage
Male	8	40
Female	10	60
Total	18	100.0

Chi-square=0.111; p<0.739 (NS)

Of the 18 cases studied, 8 cases were male and remaining 10 cases were females. Statistically equal level of incidence was observed in men compared to women as chi-square test revealed a non-significant difference (c^2=0.111; p<0.739).

Table : Distribution of the sample by cause and sex

Cause		Sex		Total
		Male	Female	
Osteoporosis	No. of cases	3	5	16
Tumors	No. of cases	2	3	13
Infection	No. of cases	1	1	3
Nutritional Disorders	No. of cases	1	1	2
Congenital Disorders	No. of cases	1	-	1
Total	No. of cases	8	10	36
	Percentage	100.0	100.0	100.0

CC=0.290; p<0.652 (NS)

A non-significant association was observed between cause and sex as contingency coefficient revealed a non-significant value (CC=0.290; p<0.652) revealing that pattern of distribution of frequencies of male and female patients for different causes was statistically same.

A significant association was observed between age and causes as contingency coefficient revealed a highly significant value (CC=0.836; p<0.000) indicating a differential pattern in the distribution of patients by age and causes. it was evident that osteoporosis and tumors were spread in different age groups, where as infection was limited to the age group of 11-20 years and congenital was limited to below 10 years.

A significant difference was observed between the frequencies of site. Chi-square value of 43.333 was found to be highly significant (p<.000). It was evident that majority of the sites were reported in Femur (50%) followed by Vetebra and Humerus (16.7% each), and least in Metatarsal, Humerus + Ulna and Femur + Ulna + vertebra (2.8% each).

Table : Distribution of the sample by mechanism of injury

Mechanism of injury	Frequency
Trivial	16
Significant	2
Total	18

Chi-square=25.00; p<0.000 (HS)

Significantly more number of patients had trivial injury (88.89%) and only 11.11 % of the cases had significant injury. Chi-square test revealed a highly significant difference between these frequencies (Chi-square=25.00; p<0.000).

Significantly more number of patients were treated with operative treatment (72.2%) and only 27.8% of the cases treated conservatively. Chi-square test revealed a highly significant difference between these frequencies (Chi-square=7.111; p<0.000**)**

DISCUSSION

Osteoporosis was the commonest cause of pathological fracture in the present study. It accounted for 8 cases of pathological fractures. In this senile osteoporosis accounted for 7 cases and disuse osteoporosis accounted for 1 case. Most modern text books and publications have quoted 90% of the pathological fractures to be due to tumors and osteoporosis and only 10% due to other causes. Yazaway et al (1990) reported 88% of cases of pathological fractures to be due to tumors and osteoporosis. This was consistent with the present study which noted 80.55% cases due to tumors and osteoporosis.

Skeletal distribution showed that femur was the most commonly involved bone to be fractured in osteoporosis accounting for 5 cases. It was followed by vertebrae and humerus which accounted for 1 cases each.

In the femur, trochanteric region was the most vulnerable accounting for 60% of fractures occurring in femur. Neck was involved in 30% of cases and shaft in 10% of cases. In the humerus, shaft was involved in 66.6% of cases and neck in 33.3%. All cases of vertebral fracture involved the body.

75% of the cases underwent surgery. Dynamic hip screw (DHS) fixation in 3 cases, hemiarthroplasty in 1 case , intramedullary nailing in 1 case and dynamic compression plating (DCP) in 2 cases. 25% of the cases were treated conservatively.

1 case of failed fixation was noticed in the study. Pain relief and restoration of function was noted to be better with surgical management when compared to nonoperative management. The results of the study were consistent with the study done by Apostolos A. Tountas where 13 elderly patients were studied retrospectively and it was found that internal fixation was associated with more favourable results.

Primary bone tumors were the second most common cause of pathological fracture in the present study accounting for 4 cases. 1 case was due to benign bone tumors and rest cases were due to malignant bone tumors. Femur (37.5%) was the commonest site involved. Humerus (25%), tibia (25%) and vertebrae (12.5%) were the other sites involved.

Osteosarcoma involved the supracondylar region of femur and was treated by an A/K amputation. Sean P Scully (1996) retrospectively revived 18 patients who sustained pathological fracture due to sarcoma.

Patients who refused surgical intervention had uniformly poor outcome. Patient who underwent amputation (6%) had no local recurrence. It was found that distant recurrence rate for patients undergoing amputation was no different from the rate for those undergoing limb salvage. In the present study no case of sarcoma developed distant metastasis as against 33% undergoing amputation in the study by Sean P Scully.

Among the benign bone tumors, giant cell tumor, simple bone cyst and accounted for 1 case each. Giant cell tumor involved the upper third tibia and was treated by curettage and bone cement. Chondromyxoid fibroma involved the head of humerus. It was treated by curettage and fixation with rush nail and bone cement. Simple bone cyst also occurred in the head of humerus. It was treated by curettage and bone grafting.

Metastatic bone tumor was the third most common cause of pathological fracture in the present study accounting for 3 cases. The results were consistent with the study done by Behr et al (1995) where 48 pathological fractures due to metastasis in 38 patients averaging 70 years of age were surgically treated. The most common metastasis was from breast (45%). The average postoperative survival was 9 months. In both the studies, pain relief, restoration of function, decreased hospitalization and facilitation of nursing care was noted to be better with surgical management as compared to non operative management. No cases of failed fixation was encountered as against four failed fixations by Behr et al (1995).

1 case of pathological fractures due to infection was seen in our study.

Jenkins in a study of 74 patients over the age of 70 years with fracture neck of femur evaluated by routine biochemical investigation (serum calcium, phosphorous, proteins, alkaline phosphatase) and biopsy at the time of surgery found that subclinical osteomalacia is more prevalent than expected.

Chalmers in his study found that subtrochanteric fracture of femur are more common than fracture neck of femur in elderly people suffering from osteomalacia. Pathological fractures due to osteomalacia often unite when supplemented with nutrients in which they had deficiency or when the underlying disorder was corrected.

One case of pathological fracture due to osteogenesis imperfecta was studied. Tibia was involved with anterolateral bowing. It was treated with multiple corticotomies and fixation with the rush nail. The deformity had corrected at follow up and fracture was uniting. In a study by JM Wilkinson using the Sheffield expanding intramedullary rods, the bones in the lower limb of 28 patients were treated for the management of osteogenesis imperfecta. Before surgery all children had multiple fractures of lower limb. At review 8 patients had experienced no further fracture but 3 had suffered five or more fractures subsequently. Before initial stabilization, 15 had never walked and only 3 used walking aids. After surgery half of these children were able to walk without using any walking aids.

CONCLUSION

Pathological fractures due to primary bone diseases should be dealt on individual basis depending upon the age, location, nature of lesion and stage of lesion. Though the final outcome of the disease might not change, adequate treatment of the fracture provided satisfactory pain relief and functional preservation for most cases. To conclude it requires more patience, regular followup and sometimes multiple surgical intervention in the proper management of pathological fractures. The treatment of the original condition is mandatory.

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