

A Study of Management of Pathological Fractures of Appendicular Skeleton

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Abstract: *Forty cases of pathological fractures of appendicular skeleton were studied. In 75% of cases studied fractures occurred secondary to minor trauma or developed spontaneously. A pathological fracture of appendicular skeleton due to metastases¹ was the commonest cause. Management of patients with pathological fractures due to secondaries is mainly palliative². Treatment should aim at keeping them pain free and ambulatory. When surgical intervention is necessary in pathological fractures due to secondaries in appendicular skeleton, intramedullary nailing² is preferable since it not only stabilizes the fracture fragments but also prophylactically stabilizes the whole length of the bone. In all the cases studied, fractures were closed because of the low energy injury mechanism associated with most of the cases.*

Keywords: Pathological Fractures, Appendicular Skeleton, Management

1. Introduction

A pathological fracture is a fracture of abnormal bone. Typically, the fracture occurs during normal activity or with minor trauma, as the abnormality of bone, reduces the strength of the bone and predisposes it to mechanical failure with minimal stress. 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 physician to the possibility of an associated pathological process. A thorough history, physical examination including lymph nodes and proper investigations are required for establishing the diagnosis. The management of the fracture may be dramatically altered by the associated pathological condition. The orthopaedic surgeon needs to work up with Radiologist, Pathologist, Oncologist and pain management specialist to provide optimal treatment and the best life possible for the patients suffering from pathological fractures.

2. Aims of the Study

To know about the common causes, sites of pathological fractures and various modes of treatment options available in the management of pathological fractures of appendicular skeleton.

3. Materials and Methods

In this prospective study, 40 cases of pathological fractures of appendicular skeleton treated in a tertiary care centre were included. All patients with following fractures of appendicular skeleton were included in the study.

- Fractures occurring spontaneously or with trivial trauma.
- Fractures in patients suffering from tumor or tumorous conditions.
- Fractures in patient having hereditary conditions like osteogenesis imperfecta.
- Fractures in patients with associated pathological process like infection.

All patients were treated as inpatients. Patients with fractures of appendicular skeleton where a clear underlying pathology could not be established, fractures involving

exclusively axial skeleton, fractures due to senile osteoporosis like Colles' fracture, fracture neck of femur, intertrochanteric fractures of femur, 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 symptoms, signs and site of fracture. Detailed present, past, family and personal history were obtained. General, systemic, detailed local examinations were carried out. Relevant blood, urine investigations were done. X-rays of affected bone and skeletal survey were done. CT scans were made available whenever necessary. Biopsy was carried out as required.

Initially the cases were treated with immobilization of the affected limb. Analgesics and antibiotics were given whenever necessary. The final treatment varied with the cause. Immobilization with splints, plaster of Paris or internal fixation, amputation, disarticulation, reconstructive limb salvage surgery, chemotherapy or radiotherapy was carried out

4. Analysis and Results

In this study of 40 cases, most common cause of pathological fracture was due to Tumors (24 cases out of 40). The next common cause was osteogenesis imperfecta. These two constituted more than 75% of all causes of pathological fractures of appendicular skeleton. 3 cases were due to osteomalacia, 4 due to infections. Hyperparathyroidism and iatrogenic cause was found to be the cause in one case each.

4.1 Causes in our study

Primary and secondary bone tumors	60%
Congenital disorders	17.5%
Infections	10%
Nutritional disease	7.5%
Hormonal imbalance	2.5%
Iatrogenic fracture	2.5%

4.2 Age Distribution

In the studied 40 cases, age distribution was found to be from 0-68 yrs. Secondaries commonly occur after the age of 40yrs. The mean age of presentation was 37.5 years.

4.3 Mechanism of injury

Out of 40 patients only 9 patients had history of significant trauma 30 patients had history of spontaneous fractures or with minor trauma. In one patient fracture was detected when evaluated for the pathology.

4.4 Sex Distribution

Out of 40 cases 22 were males and 18 were females

4.5 Skeletal Distribution

Out of 49 fractures of appendicular skeleton in 40 cases, 28 (57.14%) fractures were in the femur. 11(22.4%) in the humerus, 7 in Tibia (14.2%) 2 in Ulna (4.08%) 1 in metatarsal (2.04%).

Fractures in upper limb were 13 (26.53%). Fractures in lower limbs were 36 (73.46%). All cases of pathological fractures of appendicular skeleton observed were closed fractures, the reason being the mechanism of injury in most of the cases is low velocity injuries.

5. Discussion

Metastatic bone disease was the commonest cause of pathological fracture in appendicular skeleton, in our study. More than fifty percent of cases involved the femur. Humerus was the next common bone to be involved. The most common tumors were, multiple myeloma (35.7%) carcinoma of breast (21.4%), liver (14.2%), thyroid (14.2%), lung (7.1%). 57% of cases underwent surgery; using intramedullary nailing in 4 cases (28.4%) hemi replacement arthroplasty in 3 cases (21.4%). 6 cases (42.85%) were managed conservatively. The average post surgical survival was 7 months.

In the study pain relief, restoration of function, decreased hospitalization and facilitation of nursing care was noted to be better with surgical management than compared to non-operative management. No cases of failed fixation was encountered in our study. Primary bone tumors were the second common cause of pathological fractures of appendicular skeleton next to metastasis in our study. Ten patients with eleven fractures were noted. 6 cases were due to benign bone tumors and 4 due to malignant bone tumors. Femur (63%) was the commonest site to be involved. Humerus (27.2%) and Tibia (9%) were the other sites involved. Of the 2 cases of osteogenic sarcoma, one underwent hip disarticulation, other treated conservatively. In 2 cases of Ewing's sarcoma, one case was treated by hip disarticulation and other refused treatment. 5.2 cases that underwent surgical management have at present distant metastases without any evidence of new fractures and are on chemotherapy. Patients who refused surgical intervention had uniformly poor outcome. Patient who underwent

amputation (6) had no local recurrences and 33% developed metastases. Patients who underwent limb salvage (10) experienced 3 local recurrences and 6 distant recurrences. It was found that distant recurrence rate for patients undergoing amputation was no different from the rate for those undergoing limb salvage. Six cases of benign bone tumors with pathological fractures were encountered. 2 were due to giant cell tumor, 2 simple bone cysts, one each of aneurysmal bone cyst and fibrous dysplasia. 5 cases underwent surgery. (One resection arthrodesis, one amputation, two curettage and bone grafting, one DC plate fixation), one was treated conservatively. All 6 cases united at follow up without evidence of local recurrence.

Six patients with 10 fractures of appendicular skeleton due to osteogenesis imperfecta, constituting 15% of this study were noted. Tibia was the commonest bone to be involved (5 fractures 50%). 3 fractures were seen in femur and 2 in humerus. A newborn baby with multiple fractures expired on the 4th day. All other 5 fractures were treated conservatively and they united well at follow up. One case had anterolateral bowing of tibia after union for which corrective osteotomy and Ilizarov external fixation was done and deformity was corrected on follow up.

Four cases of pathological fractures due to infections were seen in our study. Femur was involved in 3 cases (75%) and were due to chronic osteomyelitis and 1 case (25%) involving the 5th metatarsal bone due to tuberculosis. 2 (50%) cases were treated with sequestrectomy and curettage followed by external fixation. 1 (25%) cases underwent curettage and POP immobilization. Other one case was treated with POP immobilization only. Appropriate antibiotics and antitubercular drugs were used. All four fractures united at 6 months follow up with evidence of persisting infection in 2 cases. Three patients with five fractures of appendicular skeleton due to osteomalacia were studied. In 2 patients the cause was due to chronic consumption of antiepileptics. Two femoral neck fractures, one each case of fracture shaft of femur, humerus and ulna was noted. Humerus fracture was treated with IM nailing. Other cases were treated non operatively and supplemented with Vit.D and calcium. In 2 patients, fractures united, one patient was lost at follow up.

Pathological fractures due to osteomalacia often unite with standard methods of fracture treatment, when supplemented with nutritional deficiency or when the underlying disorder is corrected.

One case of congenital pseudoarthrosis of the tibia was studied, with antero lateral bowing of the tibia. It belonged to type III of Boyd's classification, presenting with a cystic lesion in the middle third lower third junction of Tibia. Patient was treated with corrective osteotomies and Ilizarov external fixator application. At 5 months follow up, the union is seen at the pseudoarthrosis site.

One case of pathological fractures due to primary hyperparathyroidism was encountered during the study. A 20 yr old female presented with fracture neck of femur. On evaluating she was found to have multiple wedge compression fractures of vertebrae, subperiosteal erosion of

phalanges, serum calcium was high and phosphorous was low. Serum parathormone level was elevated and parathyroid scan revealed parathyroid adenoma. Parathyroidectomy was done as a primary procedure. Fracture neck was treated conservatively with Buck's skin traction. Post-operatively she developed fracture shaft of ulna which was treated conservatively with above elbow slab. At 5 months post-operatively all the fractures united, symptomatically patient became well. No evidence of new fracture was seen after that. One case of iatrogenic fracture shaft of femur was studied.

A 35 yrs old man presented with swelling of the right proximal tibia of 6 months duration, which was treated in the form of curettage and bone grafting in an outside hospital 2 months back. Patient presented to our hospital with recurrence of swelling. Biopsy revealed Grade I chondrosarcoma and he underwent wide resection, with distal femur turnoplasty and arthrodesis of knee. Post-operatively after 2 weeks radiotherapy was given for 6 weeks. At 3 months follow up patient presented with fracture shaft of the femur in the region where graft had been taken for turnoplasty. He was immobilized in a Thomas splint and intramedullary interlocking nailing was done. At 5 months post-operatively fracture united. 18 months post operatively patient expired due to respiratory failure form pulmonary secondaries.

6. Limitations of the Study

1. All the causes listed in the classification were not available for study.
2. Duration of study was short and hence the follow up and complications could not be assessed completely.

7. Conclusions

Fourty cases of pathological fractures of the appendicular skeleton were studied in detail and the following findings were noted. Males were found to be commonly affected than

females in our study as against most of the other studies in literature. Probably since the pathological fractures due to senile osteoporosis were excluded in our study which commonly involves the female population, the above results were obtained. No case of Neurological involvement at the time of presentation of pathological fracture was noted.

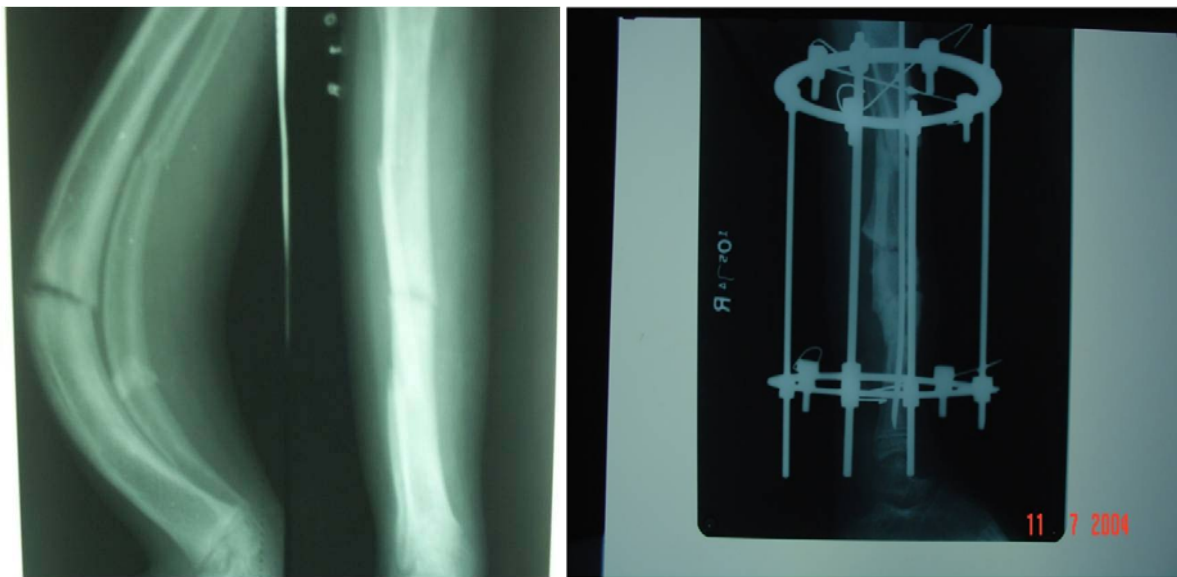
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A case of primary hyperparathyroidism with fracture neck of femur and fracture ulna.

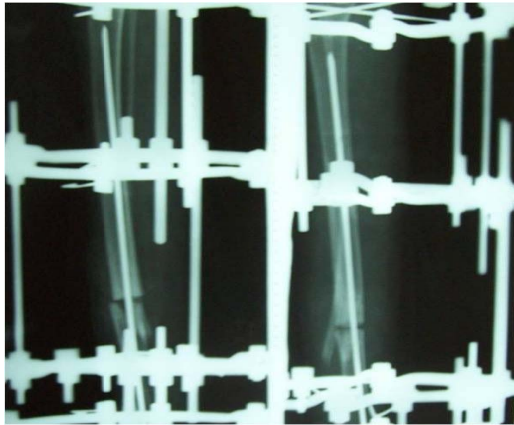


A case of osteogenesis imperfecta with Tibia fracture treated conservatively and later underwent deformity correction.



Ewing's sarcoma of distal femur with pathological fracture underwent hip disarticulation





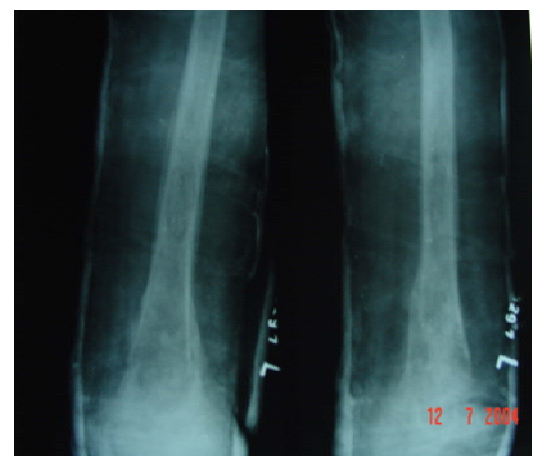
A case of congenital pseudarthrosis of Tibia, treated with osteotomy and Ilizarov external fixator.



A case of GCT of medial condyle of femur underwent resection arthrodesis of knee.



Fracture shaft of Femur secondary to metastasis from Ca liver treated with closed intramedullary interlocking nailing.



Old case of septic arthritis of left hip developed pathological fracture of left distal femur secondary to chronic osteomyelitis treated conservatively which healed well.

