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**Case Report**

# Complex pathological fracture and severe bone disease as a presenting manifestation of multiple myeloma: a case report

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## ABSTRACT

Multiple myeloma is a clonal plasma cell disorder that commonly affect bones, leading to characteristic bone findings on imaging studies. Here, we present the case of a male patient in his late-forties who presented with back pain and was found to have lytic lesions in skull and pelvis on X-ray. Further workup confirmed the diagnosis of Multiple myeloma and the patient was started on chemotherapy and denosumab. This case highlights the importance of early recognition of characteristic bone findings on imaging studies and conducting a thorough workup in patients with suspected multiple myeloma.

**Keywords:** Plasma cell dycrasia, Multiple myeloma, Pathological fracture, Punched-out lesion

## INTRODUCTION

Multiple myeloma is a rare cancer, accounting for only 1% of all cancers and around 10% of hematologic malignancies.[1]Although there have been notable advancements in treatment options, the overall survival rate remains low, with only 10%-15% of patients surpassing expected survival rates when compared to the general population.[2]

Multiple myeloma is a neoplasm that originates from post-germinal centre, terminally differentiated B cells, and is characterized by the proliferation of clonal, long-lived plasma cells within the bone marrow and consequent skeletal destruction, serum monoclonal gammopathy, immune suppression, and end-organ complications. This hematologic malignancy is typified by a complex interplay of genetic, molecular, and micro environmental factors that contribute to its pathogenesis as well as the progression. The disease's protean clinical manifestations, which range from the asymptomatic precursor states to the overt, multi-organ involvement as well as the underscore the need for a nuanced understanding of its underlying biology as well as the management strategies. [3]

The clinical presentation of multiple myeloma typically involves a range of symptoms, including anemia (seen in 75% of patients), hypercalcemia (30% cases), renal impairment (25% cases), and bone disease (70% cases).[4]Bone involvement may manifest as painful lytic lesions, pathological fractures involving vertebrae orlong bones, with approximately 80% of patients exhibiting lytic skeletal lesions.[3]

Diagnosis of multiple myeloma can be challenging, as evidenced by a recent report that over half (56%) of patients presenting to primary care settings waited over six months before being referred to a haematologist.[5] Additionally, a third of cases are diagnosed in an emergency setting rather than through general practice referrals.[4]

## CASE REPORT

A male patient in his late-forties was brought to the emergency department with a provisional diagnosis of multiple fractures. Imaging was done after a primary survey which showed complex bilateral fracture in intertrochanteric region of femur and shoulder fractures with very prominent multiple "punched-out" lesions in the pelvis (Figure 1). Patient was then stabilized, and managed by the orthopedics department for fractures. A detailed history was taken later, in which the patient disclosed not having as serious a fall which could cause the multiple fractures seen normally and that he had been experiencing back pain for the past 18 months. A pathological bone fracture was suspected and the presence of multiple "punched-out" lesions in the pelvis directed towards a diagnosis of Multiple Myeloma. Patient was referred to us and after a thorough investigation, multiple "punched-out" lesions were also found on X-ray of skull (Figure 2). The patient's laboratory evaluation revealed a low level of hemoglobin (5.3 g/dL) and an elevated erythrocyte sedimentation rate (102 mm/hr). Additionally, the patient's serum creatinine levels were high at 4.7 mg/dL. Blood smear examination indicated the presence of normocytic normochromic anemia and rouleaux formation. To confirm the patient's diagnosis based on his findings, bone marrow aspiration revealed 62% plasma cells and biopsy showed sheets of plasma cells. Detailed workup for multiple myeloma was done (Table 1).

**Table-1: Laboratory findings of the patient,**

| Test | Ref. values | Patient values |
|---|---|---|
| **Serum protein electrophoresis** | | |
| Total protein | 6.0-8.0 g/dL | 7.8 g/dL |
| Albumin | 3.30-5.70 g/dL | 2.46 g/dL |
| Beta 2 globulin | 0.10-0.50 g/dL | 1.39 g/dL |
| Gamma globulin | 0.50-1.60 g/dL | 2.76 g/dL |
| M-spike | 0.000-0.001 g/dL | 1.17g/dL |
| **Beta 2 microglobulin** | 0.6-2.4 mg/L | 6.89 mg/L |
| **Immunofixation electrophoresis** | Undetectable | IgA detected lambda detected |
| **Serum light chains** | | |
| Kappa free light chain | 3.30-19.40 mg/L | 6.93 mg/L |
| Lambda free light chain | 5.71-26.30 mg/L | 59.60 mg/L |
| Kappa lambda ratio | 0.26-1.65 | 0.120 |
| **LDH** | 110-350 IU/L | 658 IU/L |
| **Cytogenetics** | | 48, XY, +3, +11 |

The patient was diagnosed with stage III R-ISS IgA lambda (λ) multiple myeloma based on these findings. He was put on bortezomib (2 mg/week), cyclophosphamide (300 mg/m$^2$ weekly) and dexamethasone (40 mg/week) as induction chemotherapy, alongside denosumab 120 mg subcutaneously at the start of each cycle and the use of analgesics. Despite the recommendation for orthopedic intervention, the patient failed to comply with the prescribed treatment plan, resulting in a malunion of the femur. Prophylactic treatment with levofloxacin, fluconazole, acyclovir and trimethoprim/sulfamethoxazole was also administered. The patient achieved very good partial response after four cycles of VCD and is now being counseled for autologous stem cell transplant.

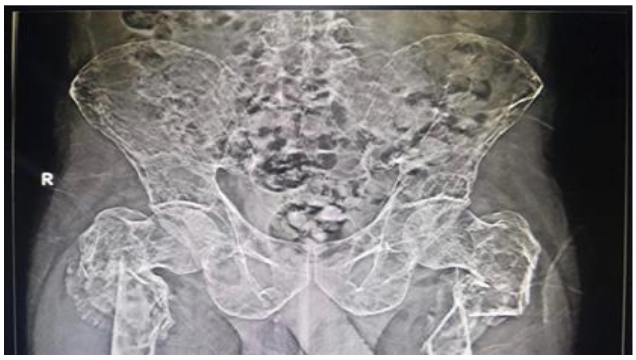


**Figure 1: X-ray image of pelvis depicting "punched-out" lesions.**

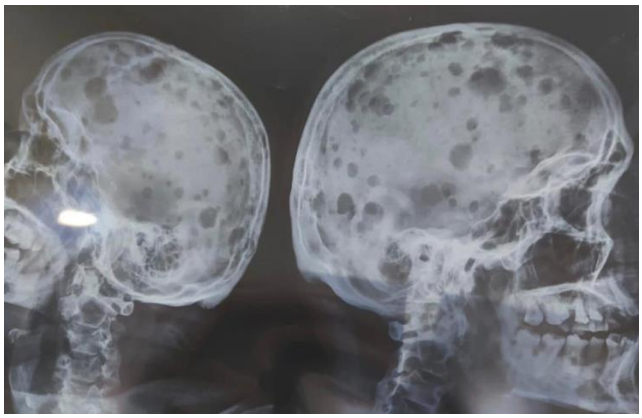

**Figure 2: Multiple "punched-out" lesions on skull X-ray (Lateral view).**

## DISCUSSION

Patients with multiple myeloma may exhibit different symptoms such as bone pain, fatigue, weakness, and recurrent infections.[4] Diagnosis of multiple myeloma usually requires a combination of laboratory tests as well as imaging studies, such as low dose whole-body CT or PET-CT. Treatment strategies for multiple myeloma are highly personalized and depend on various factors, including disease stage, patient age, comorbidities, economical condition and health insurance.

The M protein level is monitored through the use of serum protein electrophoresis (SPEP) and serum free

light chain (FLC) assay to evaluate treatment response, with a recommended monthly frequency during treatment and every 3-4 months during off-therapy periods.[1]

Patients with multiple myeloma commonly experience bone pain. To accurately determine the degree of bone disease caused by myeloma, it is crucial to perform a comprehensive skeletal survey.[4] Even in a resource limited setting a possibility of multiple myeloma should not be overlooked due to unavailability of advanced imaging modalities since even a simple survey comprising of plain radiographs of the spine, skull, chest, pelvis, and upper limb bone scan lead to the diagnosis.

Radiological evidence of skeletal involvement can be seen in almost 80% of patients with multiple myeloma on skeletal survey. The sites affected in descending order of occurrence are as follows-vertebrae (66%), ribs (45%), skull (40%), shoulder (40%), pelvis (30%), and long bones (25%).[6]

As demonstrated in our patient, radiological survey and X-ray findings only prompted us towards a suspicion of multiple myeloma and thence confirmatory investigations for the diagnosis of the disease.

The results of randomized controlled trials employing modern therapies reveal that the median survival rate for individuals with multiple myeloma is roughly 6 years.[7]

A retrospective case review study indicated that there was a tendency for patients with a delay in diagnosis of more than six months to have a lower overall survival rate.[5]The patient described in our case report postponed seeking medical attention for 18 months until it became an emergency, resulting in bones that were too fragile and presented difficulties for orthopedic procedures.

Over the past 15 years, the survival rates for individuals with multiple myeloma have significantly increased. This is largely due to the introduction of different treatment modalities such as immunomodulatory drugs, proteasome inhibitors and monoclonal antibodies. These treatments offer the potential for further improvement in outcomes.[1]

## CONCLUSION

A significant proportion of patients with bone disease related to multiple myeloma exhibit distinctive radiographic findings. Therefore, any case presenting such findings should undergo comprehensive evaluation to ascertain the potential presence of multiple myeloma. Given the high mortality rate associated with multiple myeloma, early detection and timely intervention play a critical role in improving patient outcomes and increasing survival rates. Physicians should adopt a proactive approach in the follow-up and management of these patients, prioritizing aggressive measures.

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