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Case Report

# Case of Multiple Myeloma Revealed by Bone Pain

**Imad Bougrine*, Chaimae Abourak, Amine Naggar, Najwa Ech-Cherif Kettani, Meriem Fikri, Mohamed Jiddane and Firdaous Taoursa**

*Neuroradiology Department, Ibn Sina University Hospital, Rabat, Morocco*

***Corresponding Author:** Imad Bougrine, Neuroradiology Department, Ibn Sina University Hospital, Rabat, Morocco.

**Received:** August 21, 2024; **Published:** September 16, 2024

## Abstract

Multiple myeloma is a malignant hematologic disorder characterized by the clonal proliferation of plasma cells in the bone marrow. These abnormal plasma cells produce excessive amounts of monoclonal immunoglobulin, leading to various complications such as bone lesions. Imaging plays a crucial role in the diagnosis, especially in the presence of bone pain. Techniques such as X-rays, MRI, and CT scans are essential for detecting lytic lesions, bone fractures, and other skeletal abnormalities associated with the disease. We present the case of a patient admitted with dorsolumbar pain for the past month, accompanied by weight loss. CT and MRI revealed bone lesions which, in conjunction with the biological abnormalities, are suggestive of multiple myeloma.

***Keywords:*** *Multiple Myeloma; Kahler's Disease; Monoclonal Gammopathies; Medullary Plasmacytosis*

## Introduction

Multiple myeloma (MM) is a malignant hematological disorder characterized by the clonal proliferation of plasma cells, leading to the infiltration of hematopoietic bone marrow and, in most cases, the secretion of a monoclonal immunoglobulin [1].

It accounts for 80% of cases of monoclonal gammopathies and 15% of all malignant hematological disorders [2]. The average age at diagnosis is around 70 years, and several risk factors have been identified, including exposure to ionizing radiation and pesticides [3]. There are also rare familial cases, suggesting the presence of genetic predisposition factors for the disease [3]. Imaging is frequently used for diagnosis, particularly when there are complications that may indicate the disease, as the abnormal proliferation of plasma cells can affect the entire skeletal system to varying degrees [4].

## Case Report

A 65-year-old patient with no significant medical history, presenting with dorsolumbar pain for one month and a documented weight loss of 7 kg. The CT scan (Figure 1) reveals diffuse bone demineralization with a heterogeneous and multilocular appearance of the axial skeleton due to multiple layered lytic lesions.

An MRI was performed (Figure 2) revealing multiple nodular and micronodular signal abnormalities of the axial skeleton and thoracic cage with low signal on T1, high signal on T2 and STIR, and enhancement after Gadolinium injection. Severe biconcave compressions are also observed; the main purpose of the MRI was to rule out spinal cord or nerve root compression.

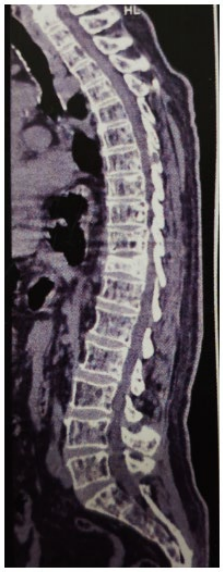

***Figure 1:*** *Sagittal CT scan image in parenchymal window without contrast injection revealing diffuse bone demineralization with a heterogeneous and multilocular appearance of the axial skeleton due to multiple layered lytic lesions, with a biconcave condensing compression of D11 reducing vertebral height by more than 50% without posterior wall collapse. This is associated with a stepped reduction in the height of several thoracolumbar vertebrae.*

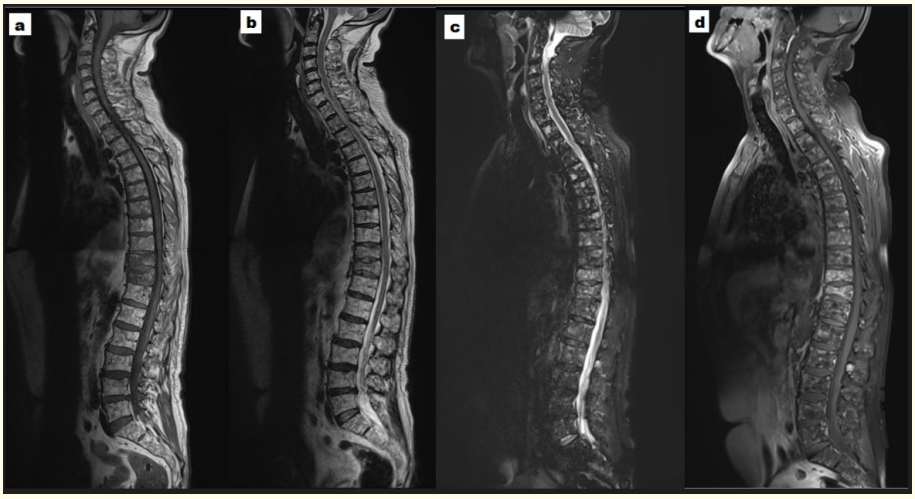


***Figure 2:*** *Sagittal MRI images, T1 sequence (a), T2 sequence (b), STIR sequence (c), and T1 post-Gadolinium injection (d), showing multiple nodular and micronodular signal abnormalities of the axial skeleton and thoracic cage with low signal on T1, high signal on T2 and STIR, and enhancement after Gadolinium injection. Severe biconcave compressions affecting the vertebral bodies of D10 and D11 are also observed, without signs of spinal cord or radicular compression.*

The biological workup showed renal insufficiency with normochromic normocytic anemia. In the presence of bone lesions, a bone marrow biopsy was performed, revealing major medullary infiltration by abnormal plasma cells.

## Discussion

In multiple myeloma bone involvement is observed in approximately 80% of patients at the time of diagnosis. The pathophysiology involves excessive bone resorption mediated by abnormal osteoclastic cells produced by cancerous plasma cells; these tumor cells also inhibit osteoblast activity. This disruption of bone metabolism makes MM a painful and debilitating disease, leading to vertebral compression that can cause radicular or spinal cord compression, as well as fractures described as 'spontaneous' or 'pathological,' which can occur without significant effort or with minimal exertion [3].

In MM, the biological workup typically reveals an elevated erythrocyte sedimentation rate (ESR) in the first hour [5]. Anemia is common and is explained by bone marrow insufficiency due to infiltration by malignant plasma cells, hemodilution, and decreased erythropoietin secondary to renal insufficiency [6]. Thrombocytopenia and leukopenia may also be present and have prognostic value, reflecting the tumor burden [7].

The diagnosis of MM is based on the concurrent presence of the following criteria: bone marrow plasmacytosis greater than 10%, the detection of a monoclonal immunoglobulin in the blood and/or urine at significant levels, and the manifestation of clinical signs related to malignant plasma cell proliferation [8].

In imaging, lytic lesions on conventional X-ray radiographs appear as round, punched-out lesions classified as Lodwick 1b, particularly visible on the skull vault, iliac bone, or long bones. Vertebral compressions are common, as well as a diffuse osteopenic appearance [9].

CT scans are more sensitive than standard radiography for detecting osteolytic lesions. They allow for three-dimensional reconstruction of images, reveal the extent of extraosseous lesions such as extramedullary plasmacytomas, and enable fine-needle biopsies for histological confirmation [9].

Magnetic resonance imaging (MRI) has high sensitivity for studying the axial skeleton and bone marrow, assessing complications such as spinal cord or radicular compression, and providing good visualization of extramedullary masses [9]. There are five patterns of bone marrow infiltration described on MRI in the context of MM [10]:

- Normal appearance of bone marrow.
- Focal pattern: Focal areas of marrow presenting as lesions with low signal on T1-weighted images, high signal on T2-weighted and STIR images, with variable enhancement on T1-weighted sequences after gadolinium injection.
- Diffuse pattern: Replacement of normal marrow by tumor cells, resulting in a diffuse low signal compared to the intervertebral disc on T1-weighted imaging, with diffuse enhancement after contrast injection and diffuse high signal on T2-weighted and STIR imaging.
- Salt and pepper pattern: Characterized by numerous millimetric lesions with low signal on T1-weighted images, high signal on T2-weighted and STIR images, and enhancement after contrast injection.
- Mixed pattern: Combines both the diffuse and focal patterns.

## Conclusion

Multiple myeloma is a challenging disease, with advancements in imaging playing a critical role in its early detection and management. Imaging modalities such as MRI, CT, and PET scans are essential for identifying skeletal lesions and assessing disease progression, significantly influencing treatment decisions.

## Declaration of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

## Informed Consent

Written informed consent was obtained from the patient.

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**Volume 7 Issue 10 October 2024**