# Case 5
# Multiple Myeloma

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## History

A 57-year-old male presents with severe back pain (Fig. 5.1).

## Diagnosis

Multiple myeloma

## Findings

- Innumerable STIR hyperintense lesions throughout the spine with mild heterogenous FDG uptake.
- Mild hypermetabolic activity associated with compression fractures at T6 and T7 vertebral bodies with mild retropulsion leading to spinal canal stenosis (arrows).
- No evidence for spinal cord compression.

## Discussion

Multiple myeloma is the most common primary bone malignancy. Myeloma occurs mostly in the elderly and is the second most common hematologic malignancy after non-Hodgkin lymphoma. It arises in the red marrow and involves monoclonal proliferation of mature plasma cells. Multiple myeloma is more prevalent in males and people of African descent. The common signs and symptoms include anemia, bone pain, renal insufficiency, fatigue, hypercalcemia, and weight loss. The overall 5-year survival is poor, despite current therapeutic options.

The use of MR and FDG PET in multiple myeloma has been increasing as these modalities provide information to detect early bone involvement, differentiate precursor lesions from true multiple myeloma, better define lytic lesions, detect extramedullary disease, predict prognosis, and assess response to treatment. Bone marrow involvement in multiple myeloma includes tumor replacement of fat which manifests as decreased T1-weighted signal intensity and increased T2-weighted or STIR signal. Out-of-phase imaging is particularly useful to detect early marrow involvement. MR imaging patterns of marrow involvement include normal marrow, a micronodular pattern (variegated or salt-and-pepper appearance), focal pattern, or diffuse infiltration. Lesions can also show contrast enhancement, although contrast-enhanced sequences are not generally performed as these patients are at a higher risk of having renal insufficiency.

FDG PET has been shown to have increased sensitivity in detecting bone marrow lesions which show mild to moderate increased FDG uptake. PET can also provide prognostic information as it has been shown that the presence of three or more FDG-avid osseous lesions on PET


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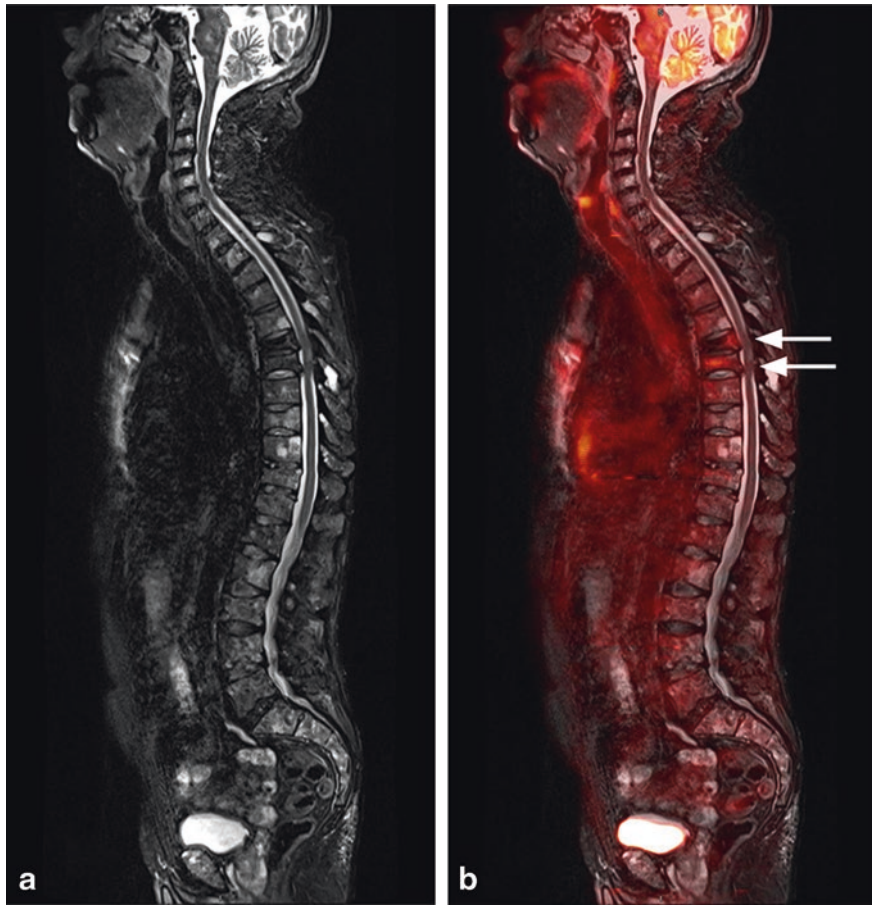


**Fig. 5.1** STIR sagittal (**a**) and PET/MR STIR sagittal fusion (**b**)

imaging or maximum SUV over 4.2 in a single lesion was associated with a worse overall survival in multiple myeloma patients. Higher maximum SUV values have also been used to predict pathologic fractures in these patients. FDG PET/MR can be used to assess response to chemotherapy or stem cell therapy by showing decreasing FDG uptake. It is also useful in detecting residual or recurrent disease.

## Suggested Reading

Ferraro R, Agarwal A, Martin-Macintosh EL, Peller PJ, Subramaniam RM. MR imaging and PET/CT in diagnosis and management of multiple myeloma. Radiographics. 2015;35(2):438–54.

Hanrahan CJ, Christensen CR, Crim JR. Current concepts in the evaluation of multiple myeloma with MR imaging and FDG PET/CT. Radiographics. 2010;30(1):127–42.