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Gallium-67 demonstration of extensive soft-tissue involvement of multiple myeloma

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A 46-year-old woman with multiple myeloma presented with neurological symptoms in the right upper extremity. After MR imaging of the cervical spine failed to show the cause of her symptoms, Ga-67 scintigraphy demonstrated increased uptake in multiple areas including the right supraclavicular region and bilateral lower extremities. Histology of the specimen obtained from the left thigh proved soft-tissue involvement of myeloma, and extensive extramedullary involvement was diagnosed. Radiotherapy to the right supraclavicular mass relieved her symptoms. Although Ga-67 scintigraphy is generally considered of limited value in multiple myeloma, this modality contributed to the development of an appropriate strategy in this patient with extensive extramedullary involvement.

Key words: Ga-67, multiple myeloma, soft-tissue involvement

INTRODUCTION

MULTIPLE MYELOMA is a malignant proliferation of plasma cells in the bone marrow, and multiple tumors are usually formed in the skeletal system. Gallium-67 (Ga-67) scintigraphy, as well as bone scintigraphy, has been reported to be insensitive to osseous lesions of multiple myeloma, and scintigraphic evaluation is not commonly performed to evaluate myeloma lesions.[1–3]

Although soft-tissue involvement is not rare in multiple myeloma, reports on the role of Ga-67 scintigraphy in assessing extramedullary lesions of multiple myeloma are limited.[4,5] In contrast, intense uptake of Ga-67 has been demonstrated in non-osseous lesions of extramedullary plasmacytoma, another form of plasma cell tumor.[6–8] Therefore, we could assume that in multiple myeloma as well, Ga-67 scintigraphy is more sensitive to soft tissue lesions than to osseous lesions. We illustrate a patient with multiple myeloma in whom Ga-67 scintigraphy demonstrated extensive soft issue involvement and contributed to patient management.

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CASE REPORT

A 46-year-old woman with IgG λ-type multiple myeloma, stage IIIA (hemoglobin 10 g/d*l*, serum calcium 13 mg/d*l*, advanced lytic bone lesions, IgG 6.9 g/d*l*, IgA 47 mg/d*l*, and serum creatinine 0.45 mg/d*l*) at the initial evaluation, had received 3 courses of chemotherapy followed by peripheral blood stem cell transplantation in our hospital. She was discharged, but two weeks later suddenly developed paresthesia, pain, and muscle weakness in the right upper extremity, and was re-admitted to our hospital. Involvement of the cervical spine was suspected; however, magnetic resonance imaging (MRI) did not show any lesions in the cervical spine. After MRI failed to detect the cause of the symptoms, she was referred for Ga-67 scintigraphy. Three days after the injection of Ga-67 citrate at a dose of 111 MBq, whole-body and planar images were acquired. Intense uptake was observed in the right lower neck as well as multiple areas of abnormally increased accumulation in the chest, abdomen, pelvis, and lower extremities (Fig. 1). The

abnormal deposits appeared mainly in extraskeletal sites, suggesting multiple soft-tissue involvement of myeloma. Then, CT visualized a mass in the right supraclavicular region (Fig. 2). The mass was considered responsible for her symptoms. MRI of the lower extremities demonstrated multiple soft tissue masses corresponding to abnormal Ga-67 deposits. These lesions were isointense on T1-weighted images and hyperintense on T2-weighted images, and showed definite contrast enhancement after injection of a gadolinium agent (Fig. 3). Histology of the specimen taken from the left thigh demonstrated a subcutaneous myeloma lesion, and confirmed the diagnosis of multiple soft-tissue involvement. The right supraclavicular mass was treated by radiotherapy, and the patient showed improvement of neurological symptoms in the right upper extremity.

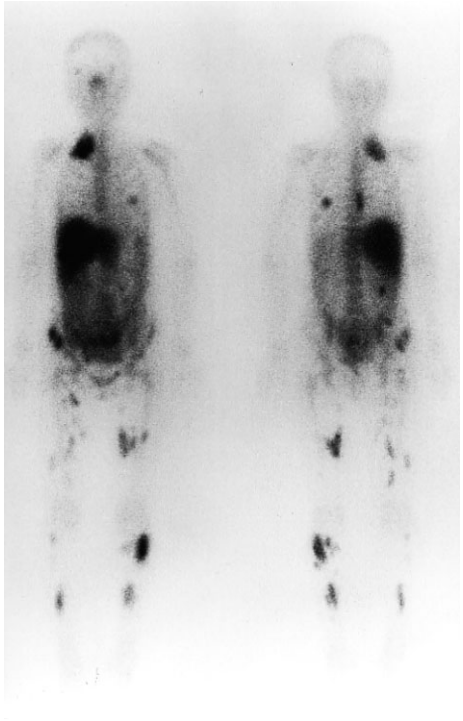


Fig. 1 Whole-body Ga-67 scintigrams (*left*, anterior image; *right*, posterior image) demonstrate multiple sites of increased accumulation including the right lower neck and bilateral lower extremities.

DISCUSSION

Soft-tissue masses may be formed in patients with multiple myeloma. Such a mass does not necessarily represent extramedullary involvement of the disease, and may

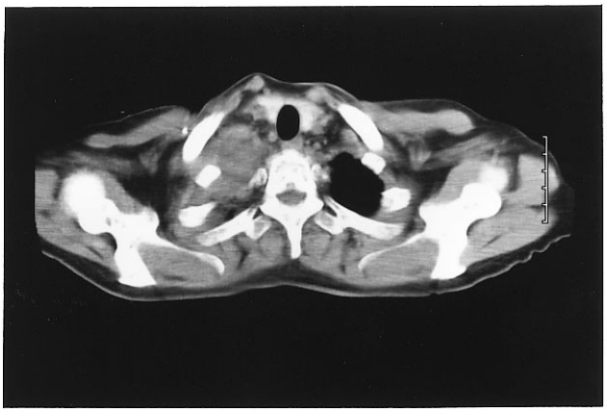
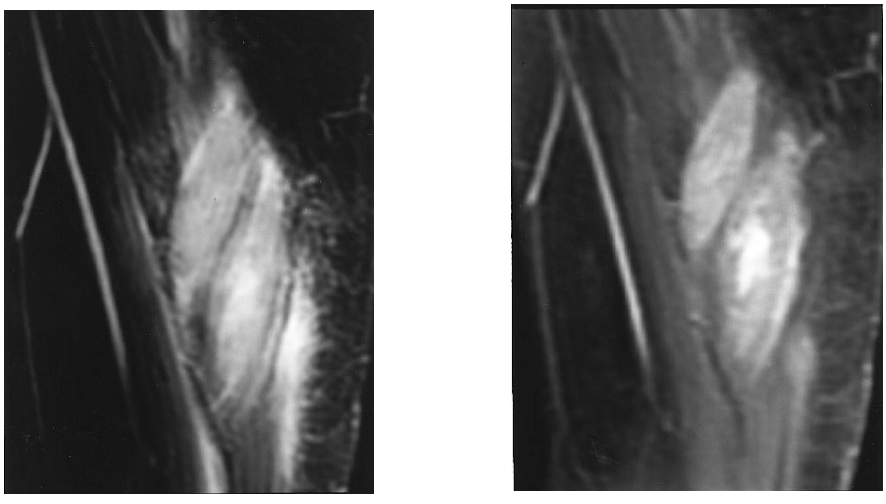


Fig. 2 Nonenhanced CT at the level of the thoracic inlet reveals a mass in the right supraclavicular region.



A **B**

Fig. 3 Sagittal MR images (observed from the left of the patient) of the medial portion of the left thigh depict subcutaneous fusiform masses showing high signal intensity on T2-weighted image (A) and postcontrast T1-weighted image (B), both with fat suppression.

be due to amyloidosis or an infectious process.[9] Histology is required to determine the presence or absence of extramedullary involvement when a soft-tissue mass is noted. In addition, histological grading of soft-tissue involvement is related to prognosis, and thus, biopsy of a soft-tissue lesion contributes to determining an appropriate patient management strategy.[9]

To date, bone scintigraphy and Ga-67 scintigraphy have shown low sensitivities to osseous lesions of multiple myeloma,[1–3] and scintigraphic assessment is not routinely performed in multiple myeloma. However, Ga-67 scintigraphy appeared useful in the patient illustrated here. It delineated multiple lesions located in various parts of the body. The lesions detected in the lower extremities were considered suitable for biopsy, and subsequently, histology of the left thigh lesion confirmed a soft-tissue involvement. Ga-67 scintigraphy facilitated selection of a representative lesion for biopsy among multiple lesions. In addition, the dissemination depicted on these images indicated the severity of the disease. The patient demonstrated neurological symptoms in the right upper extremity. In patients with multiple myeloma, plasma cell tumors may invade the bony structures, resulting in compression of the spinal cord or nerve root. MRI was performed to evaluate the presence of such compression, but failed to clarify the cause of the symptoms. Thereafter, Ga-67 scintigraphy showed a mass in the right supraclavicular region to which the symptoms were attributed. Radiotherapy to the lesion improved the symptoms. In this way, Ga-67 scintigraphy contributed substantially to determining an appropriate therapeutic strategy.

Waxman et al. described that Ga-67 scintigraphy may be of prognostic value in multiple myeloma.[1] In their study, intense Ga-67 uptake was seen in patients with rapidly progressive disease and suggested a poor prognosis. As indicated by the development of multiple soft tissue lesions, the disease in our patient was considered progressive at the time of Ga-67 scintigraphy, which may explain the clear visualization of lesions on Ga-67 images.

Extramedullary plasmacytoma is an uncommon plasma cell tumor, that arises in an extramedullary region, mainly the upper airway, without bone or bone marrow lesions. There are anecdotal reports of intense accumulation of Ga-67 in extramedullary plasmacytoma.[6–8] Soft-tissue lesions of plasmacytoma tend to show more intense Ga-67 uptake than osseous lesions. Photon attenuation in the bony structure may be a possible factor that disturbs the visualization of osseous lesions.

Recently, scintigraphy with thallium-201 or technetium-99m methoxy isobutyl isonitrile (Tc-99m MIBI) has been described to be useful in multiple myeloma for localization and follow-up of lesions.[10–14] Accumulation of Tc-99m MIBI is related to disease activity[11–13] and demonstrates non-osseous as well as osseous lesions.[13–15] Further studies are needed to determine which radiopharmaceuticals are most potent in evaluating multiple myeloma.

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