American Journal of Case Reports

ISSN 1941-5923
© Am J Case Rep, 2017; 18: 478-481
DOI: 10.12659/AJCR.903761

Received: 2017.02.13
Accepted: 2017.03.03
Published: 2017.05.01

# Neuro-Myelomatosis of the Brachial Plexus – An Unusual Site of Disease Visualized by Fluorodeoxyglucose-Positron Emission Tomography/Computed Tomography (FDG-PET/CT): A Case Report

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

DEF 1,2 Hisanori Fukunaga
DE 1 Tatsushi Mutoh
DE 1 Yasuko Tatewaki
D 1 Hideo Shimomura
D 1 Tomoko Totsune
D 1 Chiaki Terao
D 3 Hidemitsu Miyazawa
DE 1 Yasuyuki Taki

1 Department of Nuclear Medicine and Radiology, Institute of Development, Aging, and Cancer, Tohoku University, Sendai, Japan
2 Centre for Cancer Research and Cell Biology, Queen's University Belfast, Belfast, U.K.
3 Department of Radiology, Diagnostic Imaging Center, Sendai Seiryo Clinic, Sendai, Japan

**Corresponding Authors:** Tatsushi Mutoh, e-mail: tmutoh@tiara.ocn.ne.jp and Yasuko Tatewaki, e-mail: yasuko.tatewaki.a7@tohoku.ac.jp
**Conflict of interest:** None declared

**Patient:** Female, 63
**Final Diagnosis:** Extramedullary involvement of multiple myeloma
**Symptoms:** Right shoulder/upper arm, neuropathic pain
**Medication:** High-dose dexamethasone therapy
**Clinical Procedure:** FDG PET/CT
**Specialty:** Hematology • Nuclear Medicine

**Objective:** Rare disease

**Background:** Peripheral or cranial nerve root dysfunction secondary to invasion of the CNS in multiple myeloma is a rare clinical event that is frequently mistaken for other diagnoses. We describe the clinical utility of $^{18}$F-fluorodeoxyglucose positron emission tomography (FDG-PET)/CT scanning for diagnosing neuro-myelomatosis.

**Case Report:** A 63-year-old woman whose chief complaints were right shoulder and upper extremity pain underwent MRI and $^{18}$F-FDG PET/CT scan. MRI revealed a non-specific brachial plexus tumor. $^{18}$F-FDG PET/CT demonstrated intense FDG uptake in multiple intramedullary lesions and in the adjacent right brachial plexus, indicating extramedullary neural involvement associated with multiple myeloma, which was confirmed later by a bone marrow biopsy.

**Conclusions:** This is the first reported case of neuro-myelomatosis of the brachial plexus. It highlights the utility of the $^{18}$F-FDG PET/CT scan as a valuable diagnostic modality.

**MeSH Keywords:** Brachial Plexus Neuropathies • Central Nervous System • Fluorodeoxyglucose F18 • Multiple Myeloma • Neoplasm Invasiveness • Positron-Emission Tomography

**Full-text PDF:** http://www.amjcaserep.com/abstract/index/idArt/903761

619 — 2 9

## Background

Neurologic manifestations often complicate the course of patients with multiple myeloma (MM) and the peripheral neuropathies are usually related to amyloidosis or compression by tumors [1]. The pathogenesis of extramedullary involvement in MM is speculated to be as follows: 1) direct extension from MM skeletal lesions with disruption of the cortical bone; or 2) hematogenous metastatic spread to any tissue or organ, the most frequent being the skin, liver, kidney, or central nervous system [2]. The reported incidence of extramedullary involvement in newly diagnosed MM ranges from 7% to 18% [3]. Although several imaging techniques can aid in the assessment of extramedullary involvement in MM, the International Myeloma Working Group published a consensus statement indicating that PET/CT imaging should be performed in all patients in whom extramedullary involvement is suspected [4].

Here, we present a case of neuro-myelomatosis of the brachial plexus diagnosed using $^{18}$F-FDG PET/CT. To the best of our knowledge, it is the first documented case of neuro-myelomatosis of the brachial plexus.

## Case Report

A 63-year-old Japanese woman visited a general practitioner with chief complaints of right shoulder and upper extremity pain. Although the patient's physical examination was unremarkable, the transverse T2-weighted MRI images (T2WI) of head and neck (Figure 1A) and fat-saturated T2WI (Figure 1B) revealed a mild, high-intensity lesion along the right brachial plexus. Coronal gadolinium-enhanced T1-weighted images (Figure 1C) revealed mild, diffuse contrast-enhancement in the lesion, which is a non-specific signal pattern of brachial plexus lesions such as metastatic tumors, benign neurogenic tumors, malignant nerve sheath tumors, and Ewing sarcomas [5].

One week after the MRI findings, the patient presented with unexpected thrombocytopenia ($3.2\times10^4$/μL), high serum level of LDH (16320 U/L), and IgD (197 mg/dL). Then, the serum immunoelectrophoresis and bone marrow biopsy were quickly performed for advanced diagnostic purposes. These results were as follows: M-protein of the IgD-lambda type, and infiltration of clonal plasma cells with CD3 (–), CD4 (–), CD7 (+), CD10 (–), CD20 (–), CD38(+), CD56 (–), CD138 (–), Bcl-2 (–), Bcl-6 (–), c-Myc (+), MUM-1 (+), PAX5(–), OCT2(+), bob1(+), kappa(–) and lambda(+). Thus, physicians strongly suspected MM from the patient's clinical characteristics.

As shown in Figure 2, The $^{18}$F-FDG PET/CT fusion images and maximum intensity projections of her whole-body scan revealed high-intensity FDG uptake in multiple intramedullary lesions [6], and similar uptake was observed along the right brachial plexus, where the mass lesion had been detected previously via MRI. The $^{18}$F-FDG PET/CT images revealed neither disruption of cortical bone adjacent to the medullary lesions nor remodeling/destruction of trabecular bone, consistent with neuro-myelomatosis of the brachial plexus, which is defined as extramedullary neural involvement associated with MM.

The neuropathic pain was improved with high-dose dexamethasone therapy. In addition, after the combination chemotherapy with etoposide, prednisolone, vincristine, Adriamycin, and cyclophosphamide, the plasma cells in the bone marrow almost disappeared. The $^{18}$F-FDG PET/CT images confirmed complete metabolic remission of the intramedullary lesions and the right brachial plexus lesion.

## Discussion

One of the clinical features of IgD MM is the common occurrence of cytogenetic abnormalities as well as extramedullary involvement [7]; thus, this condition may present with variable

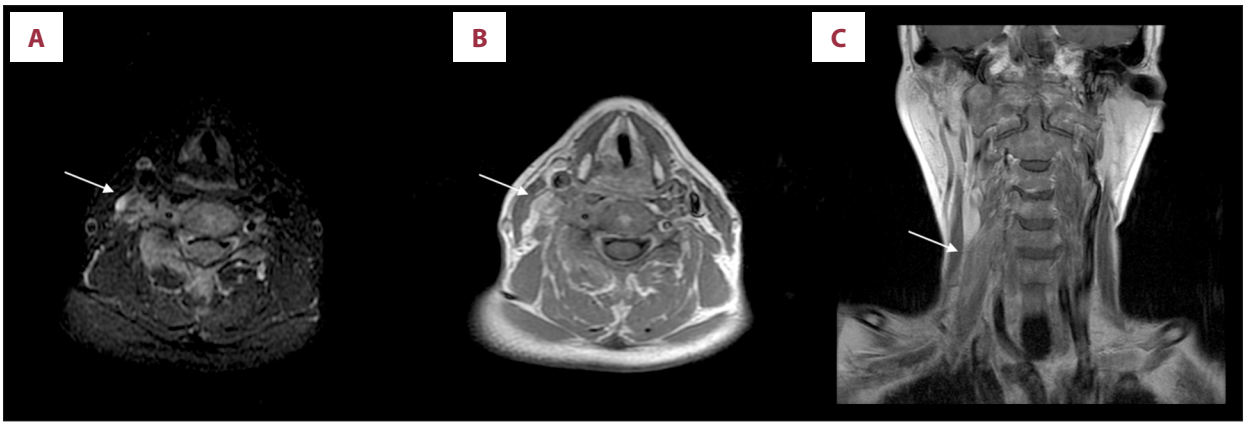


**Figure 1.** Head and neck MRI images. Transverse T2-weighted image (T2WI) (**A**), fat-saturated T2WI (**B**), and coronal gadolinium-enhanced T1-weighted image (**C**).

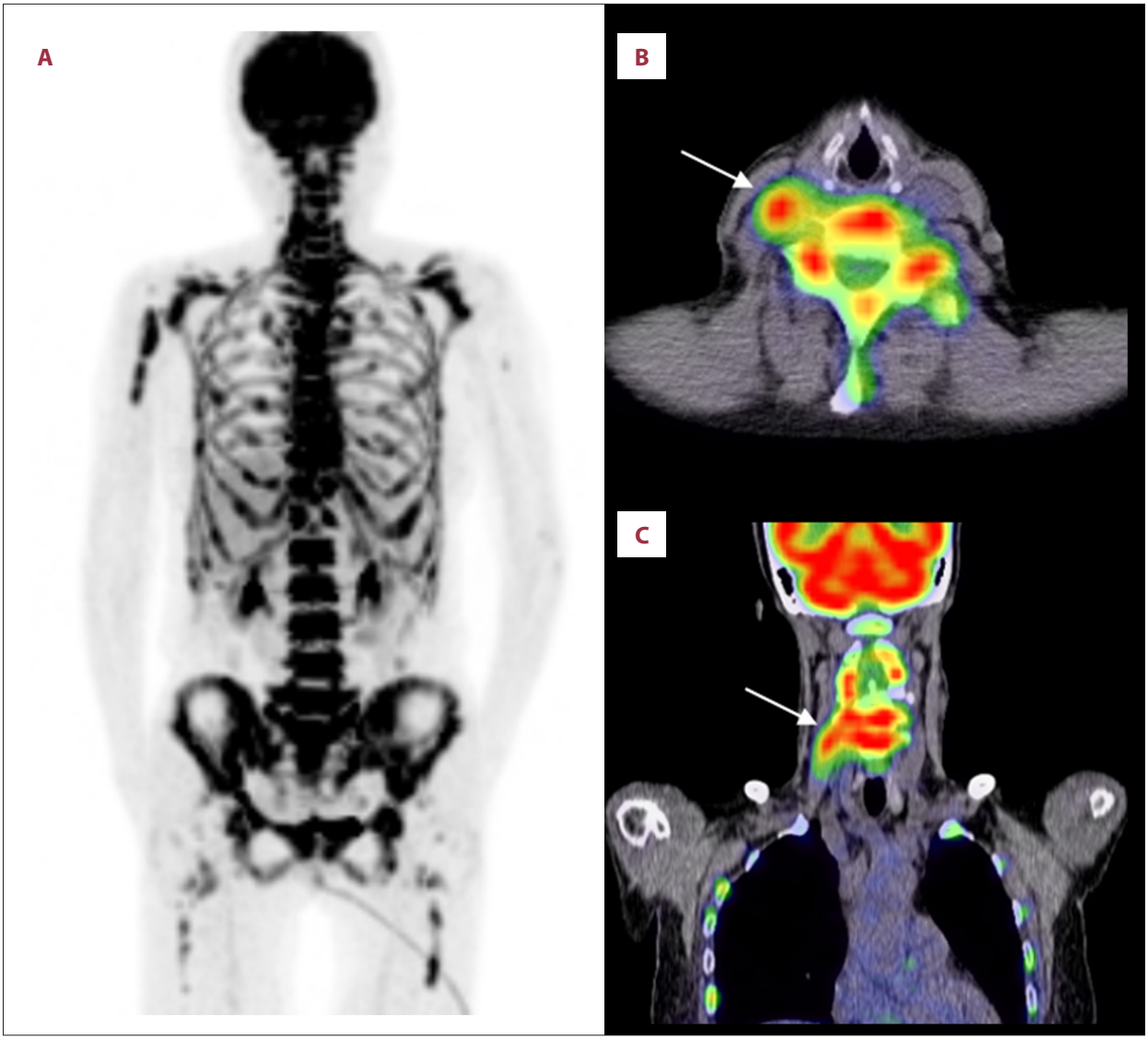


**Figure 2.** $^{18}$F-FDG PET/CT images. Maximum intensity projections of the whole-body scan (**A**) and fusion images (**B, C**).

symptoms caused by the invasion of a variety of organs, including neuro-myelomatosis. Although neurological manifestations frequently complicate the course of patients with MM [8], peripheral neuropathy is also a common complication of many of the systemic amyloidoses [9]. Neuropathies related with neuro-myelomatosis are treatable pathological conditions; therefore, differentiating neuro-myelomatosis from neuro-amyloidosis is of clinical importance.

## Conclusions

Although neuro-myelomatosis are difficult to diagnose, this case establishes $^{18}$F-FDG PET/CT as a potentially useful imaging modality for the diagnosis of extramedullary lesions associated with MM.

### Conflicts of interest

The authors declare that they have no conflicts of interest.

## References:

1. Marchettini P, Lacerenza M, Mauri E et al: Painful peripheral neuropathies. Curr Neuropharmacol, 2006; 4(3): 175–81
2. Blade J, Fernandez de Larrea C, Rosinol L et al: Soft-tissue plasmacytomas in multiple myeloma: Incidence, mechanisms of extramedullary spread, and treatment approach. J Clin Oncol, 2011; 29(28): 3805–12
3. Blade J, de Larrea CF, Rosinol L: Extramedullary involvement in multiple myeloma. Haematologica, 2012; 97(11): 1618–19
4. Dimopoulos M, Terpos E, Comenzo RL et al: International myeloma working group consensus statement and guidelines regarding the current role of imaging techniques in the diagnosis and monitoring of multiple myeloma. Leukemia, 2009; 23(9): 1545–56
5. Wittenberg KH, Adkins MC: MR imaging of nontraumatic brachial plexopathies: Frequency and spectrum of findings. Radiographics, 2000; 20(4): 1023–32
6. 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
7. Pandey S, Kyle RA: Unusual myelomas: A review of igd and ige variants. Oncology (Williston Park), 2013; 27(8): 798–803
8. Fassas AB, Muwalla F, Berryman T et al: Myeloma of the central nervous system: Association with high-risk chromosomal abnormalities, plasmablastic morphology and extramedullary manifestations. Br J Haematol, 2002; 117(1): 103–8
9. Shin SC, Robinson-Papp J: Amyloid neuropathies. Mt Sinai J Med, 2012; 79(6): 733–48