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Early detection of multiple myeloma by 2-[^{18}F] FDG PET/CT in extramedullary nasal plasmacytoma

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► ***Case report***

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ABSTRACT

Background*:** Plasma cell neoplasm is a group of disorders involving mature B-cells that results in excessive production of specific monoclonal heavy-chain immunoglobulins. Plasma cell neoplasm can present in different clinical forms. ***Case Presentation: An elderly female presented with long-standing nasal congestion and was diagnosed with nasal plasmacytoma. After a complete checkup, including 2-[^{18}F] fluorodeoxyglucose (FDG) positron emission tomography (PET)/ computed tomography (CT), a diagnosis of extramedullary nasal plasmacytoma with synchronous multiple myeloma was concluded. Herein, we report a single case of a patient with extramedullary nasal plasmacytoma and synchronous multiple myeloma, including its clinical and imaging findings. ***Conclusion:*** Multiple myeloma shows generally poor prognosis. Conversely, the prognosis of extramedullary plasmacytoma is good, and recurrence, metastasis, and transformation into multiple myeloma are rare. It is important to distinguish solitary plasmacytoma from other plasma cell diseases to choose the best treatment. A systemic understanding of the clinical and imaging features of extramedullary plasmacytoma and multiple myeloma are may help clinical and imaging doctors correctly diagnose the disease.

INTRODUCTION

Plasma cell tumors are characterized by neoplastic proliferation of a single clone of plasma cells, typically producing monoclonal immunoglobulins [(1)]. Plasma cell tumors are classified into multiple myeloma (MM), solitary bone plasmacytoma (SBP), and extramedullary plasmacytoma (EMP) according to the clinical and histological aspects of the tumor. Herein, an elderly female presented with nasal congestion and was diagnosed with nasal EMP with synchronous MM. We present this rare case to increase awareness of this unusual entity and its 2-[^{18}F] fluorodeoxyglucose (FDG) positron emission tomography (PET)/ computed tomography (CT) findings.

Case presentation

We present the case of a 72-year-old woman with onset of nasal congestion, sputum, and foreign body sensation during the previous four to five years. The patient received symptomatic treatment in the department of otolaryngology in our hospital. As the symptoms recently worsened, nasal endoscopy was performed and showed an smooth margined mass in the left inferior turbinate (figure 1). A punch biopsy of the mass was conducted and revealed plentiful plasma cells with rich cytoplasm. Immunohistochemistry revealed the neoplastic cells to be positive for CD138, CD3, CD20, kappa, and lambda light chains. Based on these features, the pathologist diagnosed the patient with extramedullary plasmacytoma in the left nasal cavity. Due to the small size of the lesion and the absence of additional symptoms, the patient was initially considered to have a solitary extramedullary plasmacytoma.

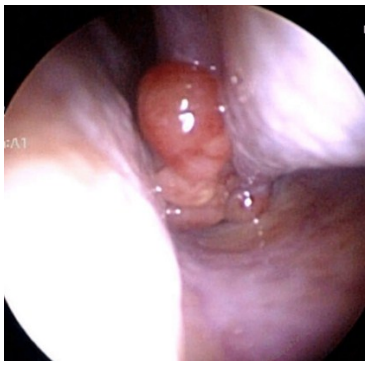


Figure 1. Endoscopic view of the mass in the left nasal cavity. A smooth, easily bleeding mass was noted around the left inferior nasal turbinate.

To evaluate the additional occult site and to exclude the possibility of systemic disease, the patient underwent a 2-[^{18}F] FDG PET/CT scan in our department. The scan was carried out on a GE DMIDR (Discovery Molecular Imaging Digital Ready, General Electric Healthcare, USA), 60 minutes after intravenous injection of 360 MBq of 2-[^{18}F] FDG. The images demonstrated a 1.4-cm-sized soft tissue lesion

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with mildly increased FDG uptake in the left inferior nasal turbinate (figure 2). Additionally, there were multiple osteolytic lesions with increased FDG uptake in the spine, scapulae, sternum, clavicles, humeri, ribs, pelvic bones, and femurs (figure 3). The nasal lesion was relatively well-bordered, showed no adjacent bone involvement, and showed a mild increase in FDG metabolism (SUVmax, 3.9), similar to benign tumors of the nasal cavity. In contrast, bone lesions along the skeleton showed an aggressive aspect with a significant increase in FDG metabolism (SUV max, 7.94). Most previous FDG PET findings in MM showed osteolytic lesions with mildly increased FDG metabolism, whereas in this case, the bone lesions had very high FDG metabolism. Regarding these imaging findings, we considered MM. In cases of intranasal lesions, if a biopsy not performed first, then a benign tumor in the nasal cavity would have been considered based on the imaging findings and associated long-standing symptoms.

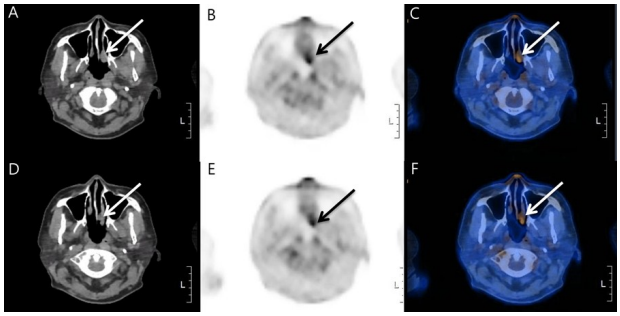


Figure 2. Images of CT **(A,D)**, 2-[^{18}F] FDG PET **(B,E)** and fused PET/CT **(C,F)** of the nasal cavity demonstrated a mild hypermetabolic soft tissue lesion (SUVmax 3.9, solid arrow).

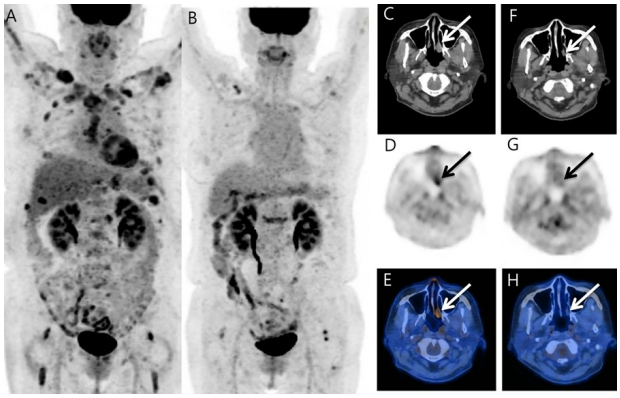


Figure 3. Maximum intensity projection (MIP, **A**) and axial (**C-E**) images from baseline [^{18}F] FDG PET/CT show multiple FDG-avid osteolytic lesions. MIP (**B**) and axial (**F-H**) images from posttreatment 2-[^{18}F] FDG PET PET/CT show resolution of the abnormal FDG uptake previously seen with the left nasal cavity lesion and decreased than before FDG uptake associated with the multiple osteolytic lesions. The patient is currently under maintenance chemotherapy.

To complete the diagnostic process, the patient underwent hematologic screening, protein electrophoresis, and bone marrow analysis. Serum protein electrophoresis showed a monoclonal peak; the kappa light chains and the lambda light chains were present at 690.16 mg/dL and 1.63 mg/L, respectively, with a k/λ ratio of 58.84. Urinary immunofixation showed a marked presence of λ-type Bence-Jones protein of 925 mg/day. Bone marrow biopsy revealed a normocellular bone marrow with plasma cell infiltrates of 5.1%. Bone biopsy at the right clavicle was performed and showed plasmacytoma. Therefore, the diagnosis of MM was confirmed.

Finally, the patient was treated with chemotherapy. After eight cycles, 2-[^{18}F]FDG PET/CT was performed for response evaluation. The repeat 2-[^{18}F]FDG PET/CT showed marked improvement of previously noted lesions in the left nasal cavity and multiple bones (figure 3).

DISCUSSION

Plasmacytoma refers to malignant plasma cell tumors, which consist of abnormal plasma cell proliferation. Plasmacytoma can be classified into two main groups: MM and solitary plasmacytoma. Solitary plasmacytoma is a rare plasma cell malignancy without evidence of systemic spread. It accounts for 5-10% of all plasma cell neoplasms and comprises two subsets: solitary extramedullary plasmacytoma (EMP) and solitary plasmacytoma of bone (SBP). EMP accounts for 3 to 5% of all plasma cell neoplasms, less than that reported for SBP [2-4]. Histologically, EMP plasma cells are identical to those seen in MM. Solitary plasmacytoma can frequently progress to MM. Biological factors that predict MM transformation need to be clearly identified. Despite having a better prognosis and lower conversion rate to MM than solitary bone plasmacytoma, EMP diagnosis can be challenging.

The prognosis of nasal EMP is good; and recurrence, metastasis, and transformation into multiple myeloma are rare. Progression to MM is more likely in patients with SBP and those with 2-[^{18}F]FDG avid lesions [5]. The degree of increased metabolism on 2-[^{18}F]FDG PET/CT is correlated with a higher risk of conversion in MM., particularly for ^{18}F -FDG avid plasmacytoma and solitary bone plasmacytoma. It is, therefore, important to distinguish EMP from MM for treatment and prognosis [6]. 2-[^{18}F]FDG PET/CT is valuable imaging method with the highest reliability detecting sites of clonal plasma cells, especially in extramedullary lesions [12]. The use of 2-[^{18}F]FDG PET/CT in the staging and follow-up of MM has been described and was shown to detect bone marrow involvement and to assess the presence of intramedullary versus extramedullary lesions in the whole body in a single procedure [7-10]. 2-[^{18}F]FDG PET/CT can differentiate active clonal proliferating plasma cells from inactive ones. It is important to differentiate between solitary plasmacytoma and MM because their prognosis varies [11, 12]. It is also

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important to distinguish solitary plasmacytoma from other plasma cell diseases to choose the best treatment. In our case, due to the detection of additional multiple bone lesions, invasive therapy was administered instead of resectioning nasal plasmacytoma combined with radiotherapy alone. The 2-[^{18}F]FDG PET/CT findings resulted in treatment changes in this patient. Considering the poor prognosis of MM, accurate staging and exclusion of the possibility of systemic involvement are important steps in the management of EMP patients.

Although plasmacytomas are uncommon head and neck tumors, they may mimic other entities that require different treatments. Solitary nasal EMP should be differentiated from other FDG-avid nasal malignancies, including squamous cell carcinoma [13], lymphoma [14], yolk sac tumor [15], and metastasis [16, 17]. The treatment of choice for EMP is radiation therapy, or in some cases, surgical resection. Thus, prompt and accurate diagnosis is critical for appropriate therapeutic decisions and prognosis. MM with EMP is challenging to diagnose. In particular, if the size of the EMP lesion is small, the degree of FDG uptake is low, the border is relatively clear, and the lesion has an insidious course, it can be mistaken for a benign tumor or inflammation with similar imaging and clinical findings.

This case study shows how MM must be ruled out before considering a diagnosis of nasal EMP. Although several reports of nasal EMP have been published, only a few have shown 2-[^{18}F] FDG PET/CT findings [5, 18- 20]. Like several previously reported 2-[^{18}F] FDG PET/CT findings, in this case, FDG uptake of the EMP lesion was mild, and there were no other clinical symptoms, so MM was not indicated. However, FDG PET/CT can detect MM and allow appropriate treatment. In addition, there have been occasional reports of secondary EMP after MM diagnosis, but there are no case reports of EMP in the nasal cavity with synchronous MM. To our knowledge, this is the first case report dealing with 2-[^{18}F] FDG PET/CT findings in a patient with EMP in the nasal cavity with synchronous MM. These results may be helpful for physicians who encounter similar situations in clinical practice.

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***Conflict of interest*:** The authors declare no conflicts of interest. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

***Ethical consideration*:** We confirm that we have read the journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines. This study was approved by the Research Ethics Committee at VHS Medical Center, and informed consent was obtained from the patient.

***Author contribution*:** Conceptualization, data curation, funding acquisition, writing, and visualization, M.C.; data curation and validation, J.Y.; review & editing, HS.K. All authors read and agreed to the published version of the manuscript.

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