

Extramedullary Solitary Plasmacytoma: Demonstrating the Role of ^{18}F -FDG PET Imaging

ARCHANA GAUTAM¹, KAMAL KANT SAHU², AHSAN ALAMGIR³, IMRAN SIDDIQI⁴, SIKANDER AILAWADHI⁵

ABSTRACT

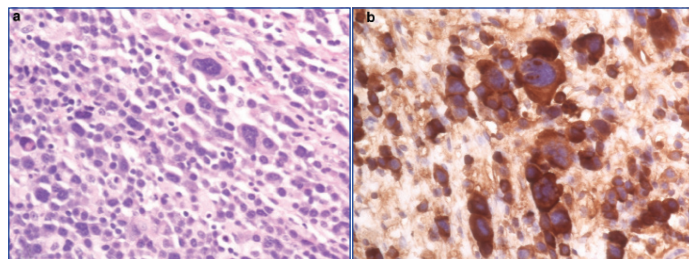
An Extramedullary Plasmacytoma (EMP) is characterized by a neoplastic proliferation of clonal plasma cells outside the medullary cavity. EMPs are a rare occurrence compared to other malignant plasma cell disorders and account for approximately 3-5% of plasma-cell neoplasms. Although most cases of EMP are not immediately life threatening at diagnosis, EMPs can progress to Multiple Myeloma (MM) and thus, warrant monitoring. Currently, there are no standard guidelines for when and how to monitor patients who are diagnosed with or treated for a solitary plasmacytoma. We present a case of solitary EMP who was treated adequately and definitively but developed a distinct, non-contiguous subsequent solitary EMP and was only discovered due to surveillance ^{18}F -Fludeoxyglucose Positron Emission Tomography (^{18}F -FDG) (PET) scan. Uniform surveillance guidelines should be developed and the potential benefits of PET and other imaging techniques as well as their cost should be considered.

CASE REPORT

A 37-year-old female presented with significant nausea, vomiting, and abdominal pain for two weeks. On examination there were no localizing symptoms, with normal bowel sounds, diffuse mild abdominal tenderness and no organomegaly or ascites. Computed Tomographic (CT) imaging showed that she had a 5.1 cm x 4.1 cm lesion involving the second part of duodenum and the pancreatic head [Table/Fig-1]. An upper gastrointestinal endoscopy and biopsy from the lesion showed this mass was infiltrated by plasma cell [Table/Fig-2a] showing lambda-restriction [Table/Fig-2b] and were also positive for CD138 and MUM-1, while negative for kappa light chains, leading to the diagnosis of EMP. A skeletal survey did not show any abnormalities, and no clonal plasma cells were detected in the bone marrow on a core biopsy. The results of the patient's laboratory tests were normal [Table/Fig-3]. Thus, the diagnosis of a solitary EMP was made. The patient underwent definitive involved-site radiation therapy with 45 Gy administered over a four-week period. Results from a follow up ^{18}F -FDG PET and CT scan were normal [Table/Fig-4]. Due to persistent symptoms from adhesions, which were considered a sequela of radiation therapy, the patient underwent a subsequent whipple procedure, which resolved the symptoms. A follow up surveillance PET/CT scan was conducted three months later and was reported normal. On further routine surveillance PET/CT, approximately seven months after the primary

Keywords: Lambda restriction, Multiple myeloma, Surveillance

treatment, the patient was found to have an FDG-avid, asymptomatic, left-sided adnexal mass with a maximum Standardized-Uptake Value (SUV max) of 8.7 [Table/Fig-5]. Considering the previous diagnosis of solitary EMP, the possibility of another EMP was entertained. She underwent surgical excision of the mass to confirm



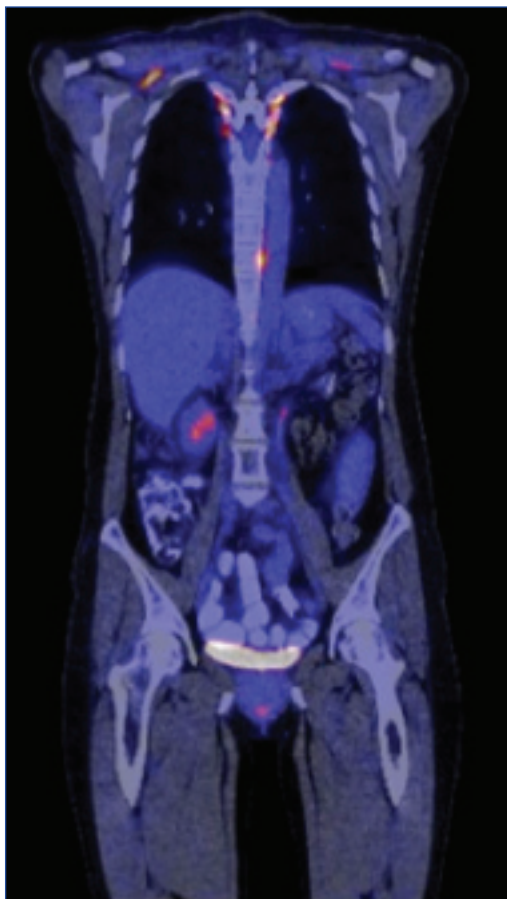
[Table/Fig-2]: (a) Plasmacytosis in excisional biopsy specimen of duodenal/pancreatic head mass (40X) at the time of initial solitary extramedullary plasmacytoma (EMP); (b) Lambda restriction in plasma cells from excisional biopsy specimen of duodenal/pancreatic head mass (40X).



[Table/Fig-1]: CT scan showing a duodenal mass on coronal and axial sections.

	At the Time of GI Plasmacytoma	After Resolution of GI Plasmacytoma	At the Time of Ovarian Plasmacytoma
Hemoglobin	12.1 g/dL	12.7 g/dL	10.6 g/dL
Total leucocyte count	10.1 X10 ⁹ /L	3.1 X10 ⁹ /L	5.2 X10 ⁹ /L
Platelet count	468 X10 ⁹ /L	313 X10 ⁹ /L	442 X10 ⁹ /L
Calcium	9.8 mg/dL	9.5 mg/dL	9.2 mg/dL
Albumin	4.6 g/dL	4.6 g/dL	4.7 g/dL
Creatinine	0.6 mg/dL	0.6 mg/dL	0.6 mg/dL
Kappa light chains	13.2 mg/L	14.3 mg/L	13.4 mg/L
Lambda light chains	12.1 mg/L	17.9 mg/L	15.8 mg/L
Kappa/lambda ratio	1.09	0.79	0.85
Serum protein electrophoresis	Normal	Normal	Normal
Skeletal survey	Normal	Normal	Normal

[Table/Fig-3]: Timeline of selected laboratory parameters at the time of diagnosis and follow up. GI = gastrointestinal



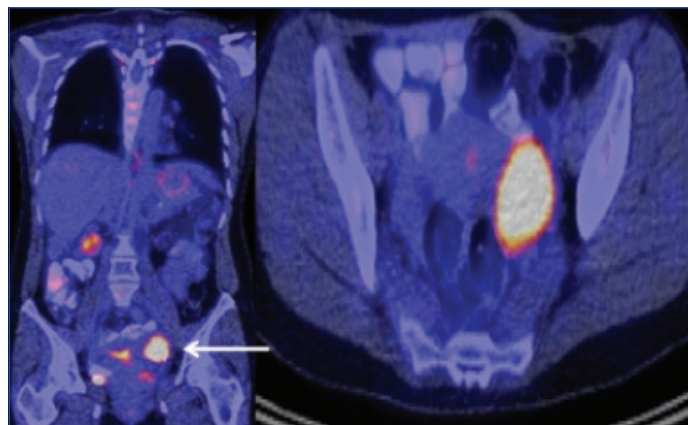
[Table/Fig-4]: Post-treatment¹⁸F-FDG PET/CT scan showing resolution of hypermetabolic lesion (coronal section).

a diagnosis, and a histopathological evaluation confirmed it to be a plasmacytoma [Table/Fig-6]. The plasma cells were again noted to be lambda-restricted, similar to the original plasmacytoma. A repeat bone marrow biopsy and laboratory testing did not show any other abnormalities suggesting an underlying active or evolving MM. She had mild anemia, but this was microcytic, and on further workup her anemia was consistent with iron deficiency [Table/Fig-3]. Due to lack of data on the benefit of adjuvant radiation therapy in plasmacytomas having undergone definitive surgical treatment, it was not considered. She was recommended to initiate systemic therapy after the second EMP occurrence to prevent further EMP or progression to active MM but she opted against it and was followed with active surveillance. The patient received PET/CT scans every three months for the first year and then every six months thereafter. She remains free of any plasmacytoma recurrence or progression to MM three years after the second episode.

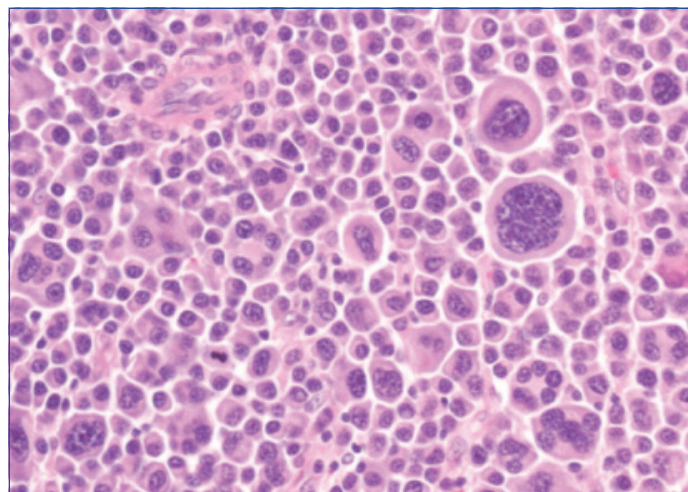
DISCUSSION

EMPs are a rare occurrence compared to other malignant plasma cell disorders and account for approximately 3-5% of plasma cell neoplasms [1]. The most common sites of EMP involvement are respiratory and gastrointestinal systems [2,3]. Although most cases of EMP are not immediately life threatening at diagnosis, EMPs can progress to MM and thus, warrant monitoring. Previous studies have reported that less than 7% patients with solitary bone plasmacytomas will develop a local recurrence after tumoricidal radiation [4] and approximately 10-15% of patients will ultimately develop MM with a higher (20%) progression rate in those with minimal bone marrow involvement [4,5]. Of note, less data is available regarding EMP that is not bone-based.

In recent years, the survival of patients with MM has significantly improved [6]. This is likely due to the availability of increasingly effective therapeutic agents that are well tolerated over long durations of treatment. Because of these encouraging improvements in patient outcomes and the availability of highly effective therapeutic agents,



[Table/Fig-5]: ¹⁸F-FDG PET/CT scan showing a hypermetabolic soft tissue left-sided adnexal mass.



[Table/Fig-6]: Plasmacytosis in excisional biopsy of ovarian mass (40X) at the time of recurrent EMP.

the International Myeloma Working Group (IMWG) has revised the definition of MM with an aim of preventing end-organ damage by initiating systemic treatment before such damage occurs [5]. The workup and definition of a solitary plasmacytoma as well as its risk of progression to MM has been well defined, and PET/CT scans have emerged as an important modality that helps confirm diagnoses and leads to definitive therapy in at least some cases [5]. Another imaging modality that is recommended frequently to confirm the solitary nature of an EMP is a Magnetic Resonance Imaging (MRI) of the spine and pelvis [7], but this is typically more expensive than a PET/CT scan and takes a longer duration to complete. Furthermore, while a MRI may be beneficial in detecting solitary plasmacytomas of bony origin, MRIs confined to certain body parts may miss EMP not associated with a bony lesion. The IMWG published a consensus statement regarding the use of MRI in the management of patients with MM [8]. The whole-body MRI is the recommended MR modality and its substitution by just the axial MRI can result in a significantly decreased sensitivity in recognizing lesions [9]. On the other hand a PET/CT scan can provide a faster, whole-body modality with a sensitivity of 96%, specificity of 77% and a particular advantage of detecting extramedullary disease [10]. In a meta-analysis highlighting the comparison of MRI and PET/CT, the major advantages of MRI were a higher sensitivity for detecting diffuse marrow infiltration and localized vertebral disease with increased risk of fracture, while the PET/CT detected a higher number of osteolytic lesions [11].

Despite the guidelines for diagnosis of an EMP, there are no specific published guidelines on how to perform surveillance in patients with plasmacytomas, especially using PET/CT scans [12]. The current NCCN guidelines for MM recommend that follow up imaging be used in cases of solitary plasmacytomas only if clarification is required for changes on the imaging studies noted at baseline or if

there is suspicion of disease progression in the form of new onset bone pain or positive laboratory test results [12]. This strategy, while a prudent utilization of available resources, does not conform to the essence of recent trends in MM, where the goal has been to detect disease presence before it causes end organ damage [5]. In our patient, while the PET/CT scan was able to detect the EMPs on both occasions, the patient had no symptoms and was otherwise healthy at the time of the second occurrence.

PET/CT scans are currently considered a standard of care diagnostic modality for MM and plasmacytomas by most insurance carriers as well as the Centers for Medicare and Medicaid Services (CMS) in the United States (US) [5]. While the exact out-of-pocket cost for a PET/CT scan to a patient may vary significantly across the US, several databases quote a wide range of costs for the technique (\$1,500-\$13,000) based on the insurance coverage, geographic location, etc., [13]. Considering the reported utility of PET/CT scans for monitoring MM [14] and the lack of data for similar benefits for plasmacytomas, this is an area that requires standardized guidelines, especially with a cost-benefit view.

CONCLUSION

The present case highlights the importance of imaging by PET/CT scans for patients with solitary plasmacytomas, and more importantly, it reflects the utility that this imaging modality can have for patient follow up and surveillance. While a PET/CT scan is almost universally performed to confirm the diagnosis of a solitary plasmacytoma, standardized guidelines need to be developed to use this and possibly other technique for patient surveillance.

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PARTICULARS OF CONTRIBUTORS:

1. Division of Hematology, Department of Oncology, Mayo Clinic, Jacksonville, FL, USA.
2. Division of Hematology, Department of Oncology, Mayo Clinic, Jacksonville, FL, USA.
3. Division of Hematology, Department of Oncology, West Virginia University, Morgantown, WV, USA.
4. Department of Pathology, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA.
5. Division of Hematology, Department of Oncology, Mayo Clinic, Jacksonville, FL, USA.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Sikander Ailawadhi,
Mayo Clinic, 4500 San Pablo Road, Jacksonville, FL, USA 32224.
E-mail: ailawadhi.sikander@mayo.edu

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