Review

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Posted Date: 21 April 2025

doi: 10.20944/preprints202504.1781.v1

Keywords: Plasmacytoma; Plasma Cell Tumor; Multiple Myeloma; Bone; Extramedullary

 doi:10.20944/preprints202504.1781.v1

Review

Solitary Plasmacytomas: Current Status in 2025

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Abstract: Solitary plasmacytoma refers to a neoplastic clonal plasma cell mass. They are divided based on their origin site; solitary bone plasmacytomas originate from the bones, and extramedullary plasmacytomas represent extraosseous tumors. These are rare tumors but carry a risk for transforming to multiple myeloma, thus, optimal management and meticulous follow-up are needed. The rarity of these tumors is the major difficulty in conducting large trials, and there are still gaps for optimal management. Newer imaging techniques and increased availability improve the quality of staging, management decisions and outcomes. Radiation still has a significant role in treatment algorithms, and adjuvant chemotherapy is gaining more importance; and trials are underway in this area. Follow-up should contain biochemical tests as the proposed response definition criteria. We aimed to review the key studies and guidelines in this paper.

Keywords: plasmacytoma; plasma cell tumor; multiple myeloma; bone; extramedullary

1. Introduction and Epidemiology

Solitary plasmacytomas (SPs), are plasma cell tumors characterized by the localized proliferation of the malignant cells. They are quite uncommon tumors, representing 5% of all plasma cell neoplasms. Solitary bone plasmacytomas (SBPs) are more common than extramedullary plasmacytomas (EMPs) and males are more affected than females. Median age at diagnosis is between 55-60 [1].

2. Diagnostic Evaluation

2.1. Clinical Features

SP, has variable manifestations dictated by the origin site. SBPs can cause pathological fractures, radiculopathy due to nerve root compression, and tumor formation by itself or amyloid accumulation [1]. EMPs have been reported for almost every tissue and the clinicoanatomic spectrum for them is enormous. Underlying EMP could present with a superior vena cava clot when stemming from mediastinal structures, a breast lump or gastric outlet obstruction [2,3]. As a result, EMP diagnosis is often diagnostically challenging, needs detailed evaluation, and multidisciplinary expert involvement.

2.2. Imaging

Imaging studies are the cornerstone of diagnosis and follow-up. Magnetic resonance imaging (MRI) and fluorodeoxyglucose positron emission tomography (FDG-PET CT) are the most common techniques to detect plasmacytomas. Plain radiographs and computed tomography generally serve as initial studies to address patients' complaints.

a. Plain radiographs

Plain radiography is easy to obtain and has been used for a very long time [4]. In addition to the first evaluation of a patient with musculoskeletal complaints, plain radiographs have been used as a skeletal survey, obtained after myeloma diagnosis to assess lytic bone lesions or concurrent bone

 doi:10.20944/preprints202504.1781.v1

plasmacytomas. SBP has lytic appearance on radiographs, called soap-bubble appearance [5,11]. There is no surrounding sclerosis and a thin zone separates the tumor from healthy bone, SBPs frequently replace trabecular bone [6,7]. Sclerotic lesions are not a usual finding and their existence may be a sign for POEMS syndrome [8]. Giant cell tumor and aneurysmal bone cysts must be considered when a cyst formation is present [9]. Plain X-ray is not sensitive for EMPs [10].

b. MRI

On MRI, SBPs are visualized as a disruption of the marrow signal due to marrow replacement. On T1-weighted images, signal intensity resembles that of muscle. It shows enhancement with gadolinium on T2W images [1]. 25% to 60% of SBPs are located in the spine. Some degree of vertebral collapse may be observed when the spine is involved. The mini-brain appearance characterized by T1W, T2W hypointense struts is highly specific for bone plasmacytoma, while hemangiomas are the major differential [11]. Whole-body MRI (WB-MRI) has emerged as a new gold standard imaging for plasma cell neoplasms, including multiple myeloma [12]. The core Myeloma Response Assesment and Diagnosis System (MY-RADS) protocol have been published [13] and this system includes a) sagittal whole spine T1W and fat-suppressed T2W sequences, b) axial whole-body diffusion-weighted imaging, c) axial whole body T1W Dixon sequences. Sagittal whole spine T1-T2W sequences are used for the evaluation of spinal anatomy, compression fractures and neural compromise while diffusion-weighted studies can provide information about the functional status of the focal or diffuse lesions [13]. MRI is a sensitive tool for determining the risk of progression to myeloma as Liebross et al. demonstrated significantly higher number of radiograph-silent-evaluated patients progressed to overt myeloma [14]. International Myeloma Working Group also mandates the exclusion of additional lesions for the diagnosis of SP [15]. WB-MRI is recommended by National Comprehensive Cancer Center (NCCN) 2025 guidelines for the evaluation of SBPs [16].

c. PET CT

Despite the well-defined role in multiple myeloma, information about PET CT usage for SPs is scarce [10]. Florine-18-fluorodeoxyglucose PET CT (18-FDG PET CT) is the first choice for assesing plasma cell neoplasms [17]. Although flourocholine has been tested versus fluorodeoxiglucose in myeloma patients and yielded superior results [18], FDG probably will keep its role in short and midterm. Most SPs are FDG-avid lesions [19]. FDG-avidity is best correlated with tumor diameter [20]. 18-FDG PET-CT is also useful in detecting additional lesions which can upstage SPs to multiple myeloma. In a prospective trial, 18-FDG-PET CT performed better than bone scintigraphy and CT in terms of detecting additional lesions [19]. Nanni et al. retrospectively investigated 14 patients to compare the diagnostic accuracy of 18-FDG-PET CT with conventional (MRI and plain radiography) imaging. 18-FDG-PET CT study was more successful than MRI, 6 of 14 patients were upstaged to myeloma, and all cases were SBPs [21].

FDG-avidity of the lesions can also serve as a prognostic marker. Alongi et al. have demonstrated that a higher post-radiotherapy maximum standardized uptake value (SUVmax) can portend a poor prognosis. In this trial, 3-year progression-free survival was 28% if the SUVmax level was greater than 4 [22]. Of note, all patients included this trial were diagnosed with SBP. Albano et al. have investigated prognostic PET CT findings at diagnosis in a mixed group of SBP and EMP patients [20]. Investigators of this trial used quantitative and semiquantitative measures such as SUVlbm (SUV lean body mass), SUVbsa (SUV body surface area), SUVbm (SUV body mass), metabolic tumor volüme (MTV), and total lesion glycolysis (TLS). This trial concluded that bone plasmacytomas, SUVlbm >5.2 tumors, and SUVbsa >1.7 tumors progressed to myeloma in a significantly shorter time [23].

2.3. Laboratory Studies

Initial laboratory studies are not varied among plasma cell neoplasms, essential tests that is suggested by NCCN v1.2025 guideline are [16]:

- • CBC, differential, and platelet count

 doi:10.20944/preprints202504.1781.v1

- • Peripheral blood smear
- • Serum BUN/creatinine, electrolytes, liver function tests, albumin, calcium, serum uric acid, serum LDH, and beta-2 microglobulin
- • Creatinine clearance (calculated or measured directly)
- • Serum quantitative immunoglobulins, serum protein electrophoresis (SPEP), and serum immunofixation electrophoresis (SIFE)
- • 24-h urine for total protein, urine protein electrophoresis (UPEP), and urine immunofixation electrophoresis (UIFE)
- • Serum free light chain (FLC) assay
- • Unilateral bone marrow aspirate and biopsy, including immunohistochemistry (IHC) and/or multiparameter flow cytometry
- • Plasma cell fluorescence in situ hybridization (FISH) panel on bone marrow [del(13), del (17p13), t(4;14), t(1 [1];14), t(14;16), t(14:20), 1q21 gain/1q21 amplification, 1p deletion]
- • NT-proBNP/BNP

Some patients with SPs have small monoclonal protein in their serum, while SBPs are more secretory than EMPs [23]. 24% to 72% SBP patients are reported as secretory, while 20% of EMPs have M protein [23]. Abnormal free light chain ratio can be found in nearly half of the SBP cases and is indicative of larger M-protein [24].

Marrow studies should be done to exclude multiple myeloma [16]. Per IMWG criteria [25]:

➔ SPs with 10% or more clonal plasma cells in bone marrow are defined as multiple myeloma
➔ SPs with less than 10% clonal plasma cells in bone marrow are defined as solitary plasmacytoma with minimal marrow involvement.

3. Treatment and Response Evaluation

a. Radiation Therapy

Optimal approach for SP should include a) durable long-term local control, b) minimizing morbidity, c) effective pain management. Up to date, radiation therapy (RT) is the standard of care for SBP and EMP, carries a possibility of cure [26].

Optimal RT dosing yet to be determined for SP. A recent study conducted in the United States suggested a survival benefit when 40-45 gray (Gy) radiation was given [27]. This large cohort consisted of 9427 patients, while 73% of them were SBP [28]. Radiation alone and with surgery was given 58% and 20% of SBP patients, 36% and 27% EMP patients. Combined modality treatment was associated with improved survival for both types of SPs. This finding calls the question of prior reports that advocate lower doses. Ozsahin et al. demonstrated no benefit of doses greater than 30 Gy, regardless of the tumor size. Tsang et al. reported that doses greater than 35 Gy did not translate into a clinical benefit for <5 cm tumors [27–29]. This approach is still endorsed by recent NCCN guidelines [16]. In 2011, Reed et al. indicated that doses 40 Gy and higher were associated with 94% local control versus 69% for lower doses [30]. Saba et al. proposed that radiation dose exceeding 50 Gy confers the greatest benefit for overall survival [27]. Some reports indicate that EMPs is better treated with slightly greater doses of radiation [31,32].

International Lymphoma Radiation Group (ILROG) recommendations are as follows [26]:

a. SBPs smaller than 5 cm; 35 Gy
b. SBPs 5 cm and greater; 40-50 Gy
c. EMPs; doses lower than 40 Gy is not adequate. 40-50 Gy is recommended. Selected low tumor burden patients are set to receive 40 Gy.

Head and neck EMPs can spread to cervical lymph nodes in 15% of cases [33]. ILROG guidelines recommend against prophylactic irradiation to cervical nodes for Waldeyer's ring structure-originated EMPs [26]. Except for these tumors, ipsilateral uninvolved cervical lymph nodes may be treated with radiation [26].

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Toxicities would be expected, but generally well-tolerated. Common acute adverse reactions are mucositis and local erythema. The most common late toxicities are xerostomia and fatigue. Grade 4 toxicity is not expected, while grade 3 toxicity was only 4% in one study [34].

b. Surgery

Surgery alone is not considered a standard therapy according to recent guidelines [10,16]. However, mainly head and neck EMPs can be treated with radical surgery alone with excellent outcomes. According to a retrospective study from the Surveillance, Epidemiology and End Results (SEER) database, surgery alone is superior in terms of survival to radiation and combined modality. The 5-year relative survival for the surgery-only approach was 96.7% in this study. Progression to MM rate was not reported [35]. Inversely, some researchers are advocating for avoiding radical surgeries for head and neck EMPs, due to the difficulty of obtaining negative surgical margins and radiosensitivity of these tumors [23]. Goyal et al. reported that genitourinary and gastrointestinal EMPs are most commonly treated with surgery alone [36]. In a recent report, it was reported that radiation-only therapy confers better protection for MM progression than surgery-only [37].

Saba et al. concluded that the median overall survival is 137 months for those treated with surgery alone, which is longer than radiation alone. The surgery alone approach was used more for EMPs than the SBPs (23% vs 8%) [27].

While radiation is considered first for SBPs, certain clinical scenarios would warrant a surgical intervention like spinal tumors with neurological compromise [23]. Also in one report, surgery was found as a positive prognostic factor for SBPs, mainly located in spine [38].

c. Chemotherapy

The role of chemotherapy in SP treatment is a highly controversial issue. Studies that are before the novel agents and their small sample size contribute to the uncertainty [39]. Ascione et al. recently performed a retrospective analysis of 77 SBP patients, thirty-two of them treated with chemotherapy. 24 of 32 patients received chemo as adjuvant therapy [39]. The main reason for giving chemo was the inability to reach a CR and the median time from radiotherapy to chemotherapy was 4.3 months. Immunomodulatory drugs were the most prescribed therapy (87.5% of patients). 5-year MMFS rate was 62.9% for patients treated with adjuvant chemotherapy and 41.7% for radiotherapy alone. In this study, chemotherapy-treated patients had more frequently detectable M-protein, thus conferring a higher-risk patient group [39]. Mignot et al. investigated concomitant radiotherapy with lenalidomide and dexamethasone. In this analysis, lenalidomide was administered for 21 days in a 28-day cycle, with a total of 4 cycles, and dexamethasone was routinely added at 40 mg per week. PET-CT examination was performed at month 4 of therapy. MMFS (100% vs 77.1%) and PFS (81.7% vs 48.4%) rates were significantly higher than radiation alone therapy [40]. Mheidly et al. found no OS difference between chemo plus radiation and radiation alone, although PFS benefit was prominent in those younger than 60 years and received combined therapy. These patients' median PFS was 209 months and 5-year PFS was 89%, while the median PFS was 20 months and 5-year PFS was 46.5% in the radiation alone arm. In this trial 85% of patients had less than %5 plasma cells on bone marrow specimens and 85% of patients had detectable serum M-protein. Lenalidomide was not used for any patient while autologous stem cell transplant and melphalan-based triplet were the most common modalities, suggesting an important role of melphalan [41]. An older prospective trial also suggested the benefit of melphalan treatment after radiation for SBPs [42].

4. Follow-Up, Response Assessment and Prognosis

Per NCCN guidelines, response assessment should not be done less than three months after radiation therapy. Clinicians should be aware that response assessments should not rely solely on imaging techniques, and the laboratory should be combined with imaging [16]. The European Expert Panel defined response definitions and these criteria remain unchanged today [10]. Table 1 demonstrates response definitions for SBPs and EMPs [10]. While the Expert Panel favors FDG-PET

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CT over MRI for follow-up imaging for all SPs, NCCN guideline recommends FDG PET-CT for EMPs primarily [10,16]. Whole-body MRI is the NCCN's choice for the follow-up of SBPs over PET-CT [16].

Table 1. Response definitions in solitary plasmacytoma.

Response Class	Definition
Complete Response (CR)	Complete disappearance of all previously observed abnormalities on radiographic imaging. For patients with a secretory plasmacytoma, a disappearance of monoclonal protein from serum and/or urine. For SBP, the initial radiological abnormalities on MRI or CT should regress or stabilize during an observation time of at least 12 months to fulfill the requirements for a CR. For EMP, the disappearance of soft tissue mass is required for the definition of CR
Very good partial response (VGPR)	A CR with regard to clinical and radiological signs, but with a positive immunofixation or ≥90% reduction in serum monoclonal protein plus urine monoclonal protein level < 100 mg/24 h
Partial response (PR)	A ≥50% decrease in serum and/or urine monoclonal protein. For non-secretory SP, radiological features (MRI/CT) or local assessment is needed. In EMP patients, a 30% decrease in the diameter of target lesions should be observed
Stable disease (SD)	Insufficient shrinkage to qualify for PR nor sufficient increase to qualify for PD
Progressive disease (PD)	The development of new lesions or an increase of at least 20% in the size of existing lesions, the apparition of a myeloma defining event, and finally an increase of >25% from lowest response value in serum and/or urine monoclonal protein

Prognostic factors determining general survival and progression to myeloma can be assessed at diagnosis and follow-up. EMPs have a better prognosis than SBPs, while median overall survivals were reported to be around 89 months for SBPs and 117.3 months for EMPs [43]. Evolving into multiple myeloma, is a serious consideration when discussing the prognosis of the SPs. SBPs progresses to multiple myeloma at a rate of 65-84% at 10 years and median progression time is around 2-5 years [44]. Larger lesions, older age, high M-protein levels at diagnosis and persistence of M-protein after definitive management are the historical prognosis variables for solitary bone plasmacytomas [14,45,46]. Genetics have a significant role for myeloma progression, as Yadav et al. proposed [47]. In their retrospective analysis, high-risk cytogenetic abnormalities detected by FISH in the clonal plasma cells, obtained either directly from the diagnostic tissue sample or from bone marrow, are associated with a greater tendency to myeloma progression [47]. High risk lesions are defined as del(17p), t(14;16), t(4;14) and/or +1q (gain or amplification) [47]. Median multiple myeloma progression time was significantly shorter for patients with high-risk FISH (8 vs 42 months, $p<0.001$) [47]. Deletion 17p and +1q abnormalities were the most common FISH abnormalities responsible for the faster progression [47]. Despite the data suggesting a relationship between high-risk genetics and myeloma progression, radiotherapy success is not influenced by the genetic features [48]. Fouquet et al. investigated the prognostic significance of serum free light chain (sFLC) ratio and FDG-PET CT findings [49]. Multivariate analysis showed that initial abnormal involved FLC and the number of hypermetabolic lesions on the initial FDG-PET CT were the most common prognostic markers in this trial, abnormal involved FLC at diagnosis and two and more hypermetabolic lesions on the FDG-PET conferred to shortest time to myeloma progression, median 21 months [49]. Multiparameter flow cytometry is also useful for assessing prognosis in solitary plasmacytoma [50]. Paiva et al. investigated the importance of the multiparameter flow cytometry findings regarding the progression to myeloma. All patients had less than 5% plasma cells by microscopy in this study.

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Clonal plasma cells were detected in 49% of SBPs and 38% of EMPs. Flow-positive patients at diagnosis progressed to myeloma more frequently than flow negatives (71% vs 8%, p <0.001). Flow positivity was described as at least 20 plasma cells detectable by multiparameter flow cytometry at a sensitivity level of 10-4 in this trial [50].

5. Conclusions

Still, SBP caries many uncertainties mainly about optimal management and is considered a low-risk disease condition, and radiation therapy is curative for nearly one-half of the patients. Even with the radiation therapy, patients presenting with at least one of the high-risk markers have a median time to progression to symptomatic myeloma roughly 1 year, demonstrating that there is an unmet need of patients who need systemic treatment to prevent further end organ damage. We believe the rarity of the disease and the reluctance of the physicians have roles in most of the dilemmas. Larger, well-designed and prospective trials are urgently needed to further clarify the issue.

Conflicts of Interest: The authors declare that there is no conflict of interest.

References

1. Gertz M, Rajkumar V. *Multiple Myeloma Diagnosis and Treatment* 1th edition, Springer Nature: New York, USA, 2014, p:195-210.
2. Zhang H, Miao Q, Liu J, Li X, Deng H. Complete resection of a mediastinal solitary extramedullary plasmacytoma and reconstruction of right pulmonary artery and superior vena cava. *Ann. Thorac. Surg.* **2011**, *92*, 2244–2246
3. Stefanidis K, Yusuf G, Mulita F, Tsalikidis C, Mitsala A, Konstantelou E, Kotsopoulou M, Koletsis E, Pitiakoudis M, Dimopoulos P. Extraosseous Plasmacytomas: A Radiologist's Perspective—A Narrative Review of the Literature. *Diagnostics* **2024**, *14*, 1788.
4. Brown AK. How to interpret plain radiographs in clinical practice. *Best Pract Res Clin Rheumatol*. 2013 Apr;27(2):249-69.
5. Liebross RH, Ha CS, Cox JD, Weber D, Delasalle K, Alexanian R. Solitary bone plasmacytoma: outcome and prognostic factors following radiotherapy. *Int J Radiat Oncol Biol Phys.* 1998;41(5):1063–7.
6. Dimopoulos MA, Moulopoulos LA, Maniatis A, Alexanian R. Solitary plasmacytoma of bone and asymptomatic multiple myeloma. *Blood*. 2000 Sep 15. 96(6):2037-44.
7. Rodallec MH, Feydy A, Larousserie F, Anract P, Campagna R, Babinet A, Zins M, Drape JL. Diagnostic imaging of solitary tumors of the spine: what to do and say. *Radiographics*. 2008;28:1019–41.
8. Miralles GD, O'Fallon JR, Talley NJ. Plasma-cell dyscrasia with polyneuropathy. The spectrum of POEMS syndrome. *N Engl J Med*. 1992 Dec 31. 327(27):1919-23.
9. Huvos AG, ed. Multiple myeloma including solitary osseous myeloma. *Bone Tumors: Diagnosis, Treatment, and Prognosis*. Philadelphia, Pa: WB Saunders Co; 1992. 653-67.
10. Caers, J., Paiva, B., Zamagni, E. et al. Diagnosis, treatment, and response assessment in solitary plasmacytoma: updated recommendations from a European Expert Panel. *J Hematol Oncol* **11**, 10 (2018).
11. Patnaik S, Jyotsnarani Y, Uppin SG, Susarla R. Imaging features of primary tumors of the spine: A pictorial essay. *Indian J Radiol Imaging*. 2016 Apr-Jun;26(2):279-89.
12. Hameed M, Sandhu A, Soneji N, Amiras D, Rockall A, Messiou C, Wallitt K, Barwick TD. Pictorial review of whole body MRI in myeloma: emphasis on diffusion-weighted imaging. *Br J Radiol*. 2020 Nov 1;93(1115):20200312. Epub 2020 Aug 26. PMID: 32667830; PMCID: PMC8519646.
13. Messiou C, Hillengass J, Delorme S, Lecouvet FE, Moulopoulos LA, Collins DJ, et al. Guidelines for acquisition, interpretation, and reporting of whole-body MRI in myeloma: myeloma response assessment and diagnosis system (MY-RADS) *Radiology* 2019; 291: 5–13
14. Liebross RH, Ha CS, Cox JD, Weber D, Delasalle K, Alexanian R. Solitary bone plasmacytoma: outcome and prognostic factors following radiotherapy. *Int J Radiat Oncol Biol Phys*. 1998;41:1063–1067

 doi:10.20944/preprints202504.1781.v1

15. Dimopoulos MA, Hillengass J, Usmani S, Zamagni E, Lentzsch S, Davies FE, Raje N, Sezer O, Zweegman S, Shah J, et al. Role of magnetic resonance imaging in the management of patients with multiple myeloma: a consensus statement. *J Clin Oncol*. 2015;33:657–664
16. National Comprehensive Cancer Network. (2025). Multiple Myeloma (NCCN Guideline Version 1.2025). Retrieved from https://www.nccn.org/professionals/physician_gls/pdf/myeloma.pdf
17. Albano D, Tomasini D, Bonù M, Giubbini R, Bertagna F. ^{18}F-FDG PET or PET/CT role in plasmacytoma: A systematic review. *Rev Esp Med Nucl Imagen Mol (Engl Ed).* 2020 Jul-Aug;39(4):220-224. English, Spanish.
18. Garrastachu Zumarán P, García Megías I, Mangas Losada M, Mendoza Melero A, Villanueva Torres A, Boulvard Chollet X, Romero Robles L, Hernández Pérez PM, Ramírez Lasanta R, Delgado Bolton RC. Multitracer PET/CT with [^{18}F]Fluorodeoxiglucose and [^{18}F]Fluorocholine in the Initial Staging of Multiple Myeloma Patients Applying the IMPeTus Criteria: A Pilot Study. *Diagnostics (Basel).* 2023 Apr 27;13(9):1570.
19. Schirrmeister H, Buck AK, Bergmann L, Reske SN, Bommer M. Positron emission tomography (PET) for staging of solitary plasmacytoma. *Cancer Biother Radiopharm*. 2003;18:841–5
20. Albano D, Bosio G, Treglia G, Giubbini R, Bertagna F. 18F-FDG PET/CT in solitary plasmacytoma: metabolic behavior and progression to multiple myeloma. *Eur J Nucl Med Mol Imaging*. 2018;45(1):77–84.
21. Nanni C, Rubello D, Zamagni E, Castellucci P, Ambrosini V, Montini G, et al. 18FFDG PET/CT in myeloma with presumed solitary plasmocytoma of bone. In Vivo. 2008;22:513–7
22. Alongi P, Zanoni L, Incerti E, Fallanca F, Mapelli P, Papathanasiou N, et al. 18F-FDG PET/CT for early postradiotherapy assessment in solitary bone plasmacytoma. *Clin Nucl Med*. 2015;40:e399–3404
23. Grammatico S, Scalzulli E, Petrucci MT. Solitary Plasmacytoma. *Mediterr J Hematol Infect Dis.* 2017 Aug 23;9(1):e2017052.
24. Dingli D, Kyle RA, Rajkumar SV, Nowakowski GS, Larson DR, Bida JP, Gertz MA, Therneau TM, Melton LJ, 3rd, Dispenzieri A, Katzmann JA. Immunoglobulin free light chains and solitary plasmacytoma of bone. *Blood*. 2006;108:1979–83
25. Rajkumar SV, Dimopoulos MA, Palumbo A, Blade J, Merlini G, Mateos MV, Kumar S, Hillengass J, Kastritis E, Richardson P, Landgren O, Paiva B, Dispenzieri A, Weiss B, LeLeu X, Zweegman S, Lonial S, Rosinol L, Zamagni E, Jagannath S, Sezer O, Kristinsson SY, Caers J, Usmani SZ, Lahuerta JJ, Johnsen HE, Beksac M, Cavo M, Goldschmidt H, Terpos E, Kyle RA, Anderson KC, Durie BG, Miguel JF. International Myeloma Working Group updated criteria for the diagnosis of multiple myeloma. *Lancet Oncol*. 2014 Nov;15(12):e538-48.
26. Tsang RW, Campbell BA, Goda JS, Kelsey CR, Kirova YM, Parikh RR, Ng AK, Ricardi U, Suh CO, Mauch PM, Specht L, Yahalom J. Radiation Therapy for Solitary Plasmacytoma and Multiple Myeloma: Guidelines From the International Lymphoma Radiation Oncology Group. *Int J Radiat Oncol Biol Phys*. 2018 Jul 15;101(4):794-808.
27. Ludovic Saba, Chieh-Lin Fu, Kaylee Sarna, Hong Liang, Barbara Geraldine Dominguez, John Greskovich, Chakra Pani Chaulagain; Real-World Treatment Patterns and Outcomes of Solitary Plasmacytoma in the United States: A National Cancer Database (NCDB) Analysis of Years 2004-2020. *Blood* 2023; 142 (Supplement 1): 2025
28. Ozsahin M, Tsang RW, Poortmans P, Belkacémi Y, Bolla M, Dinçbas FO, Landmann C, Castelain B, Buijsen J, Curschmann J, Kadish SP, Kowalczyk A, Anacak Y, Hammer J, Nguyen TD, Studer G, Cooper R, Sengöz M, Scandolaro L, Zouhair A. Outcomes and patterns of failure in solitary plasmacytoma: a multicenter Rare Cancer Network study of 258 patients. *Int J Radiat Oncol Biol Phys*. 2006 Jan 1;64(1):210-7. doi: 10.1016/j.ijrobp.2005.06.039. Epub 2005 Oct 17. PMID: 16229966.
29. Tsang RW, Gospodarowicz MK, Pintilie M, Bezjak A, Wells W, Hodgson DC, Stewart AK. Solitary plasmacytoma treated with radiotherapy: impact of tumor size on outcome. *Int J Radiat Oncol Biol Phys*. 2001 May 1;50(1):113-20. doi: 10.1016/s0360-3016(00)01572-8. PMID: 11316553.
30. Reed, V. K., Shah, J. J., Medeiros, L. J., Ha, C. S., Mazloom, A., Weber, D. M., … & Dabaja, B. S. (2011). Solitary plasmacytomas. *Cancer*, 117(19), 4468-4474. https://doi.org/10.1002/cncr.26031
31. Zhu Q, Zou X, You R, et al. Establishment of an innovative staging system for extramedullary plasmacytoma. *BMC Cancer*, 2016; 16:777.

 doi:10.20944/preprints202504.1781.v1

32. Strojan P, Soba E, Lamovec J, et al. Extramedullary plasmacytoma: Clinical and histopathologic study. *Int J Radiat Oncol Biol Phys* 2002;53:692-701
33. Sasitharan, P., Yusof, N. I. M., & Raju, K. V. (2018). Extramedullary plasmacytoma of the nasal cavity: a case report. *Romanian Journal of Rhinology*, 8(32), 233-234.
34. Represa, Victoria, et al. "Solitary plasmacytoma: should new approaches in diagnosis and treatment be adopted?." *Reports of Practical Oncology and Radiotherapy* 29.4 (2024): 501-508.
35. Thumallapally N, Meshref A, Mousa M, Terjanian T. Solitary plasmacytoma: population-based analysis of survival trends and effect of various treatment modalities in the USA. *BMC Cancer* 2017;17:13.
36. Goyal G, Bartley AC, Funni S, Inselman J, Shah ND, Marshall AL, Ashrani AA, Kapoor P, Durani U, Hashmi SK, Siddiqui MA, Buadi FK, Go RS, Kyle RA, Kumar S, Gonsalves WI. Treatment approaches and outcomes in plasmacytomas: analysis using a national dataset. *Leukemia*. 2018 Jun;32(6):1414-1420.
37. Vasudevan SS, Sayed SBH, Kapartiwar P, Pang J, Asarkar AA, Olinde L, Katz S, Beedupalli K, Nathan CO. Radiotherapy vs Surgery for Survival and Locoregional Control of Head and Neck Extramedullary Plasmacytoma: A Systematic Review and Meta-Analysis. *JAMA Otolaryngol Head Neck Surg*. 2024 Oct 1;150(10):887-895.
38. Shen, X., Liu, S., Wu, C., Wang, J., Li, J. and Chen, L. (2021), Survival trends and prognostic factors in patients with solitary plasmacytoma of bone: A population-based study. *Cancer Med*, 10: 462-470.
39. Ascione S, Harel S, Besson FL, Belkhir R, Henry J, Royer B, Arnulf B, Mariette X, Seror R. Chemotherapy in solitary bone plasmacytoma to prevent evolution to multiple myeloma. *Haematologica*. 2023 Nov 1;108(11):3160-3164.
40. Mignot F, Schernberg A, Arsène-Henry A, Vignon M, Bouscary D, Kirova Y. Solitary Plasmacytoma Treated by Lenalidomide-Dexamethasone in Combination with Radiation Therapy: Clinical Outcomes. *Int J Radiat Oncol Biol Phys*. 2020 Mar 1;106(3):589-596.
41. Mheidly K, Lamy De La Chapelle T, Hunault M, Benboubker L, Benchalal M, Moreau P, Baugier de Materre A, Decaux O, Laribi K. New insights in the treatment of patients with solitary bone plasmacytoma. *Leuk Lymphoma*. 2019 Nov;60(11):2810-2813.
42. Avilés A, Huerta-Guzmán J, Delgado S, Fernández A, Díaz-Maqueo JC. Improved outcome in solitary bone plasmacytomata with combined therapy. *Hematol Oncol*. 1996 Sep;14(3):111-7.
43. Ghiassi-Nejad, Zahra et al. Overall Survival Trends and Clinical Characteristics of Plasmacytoma in the United States: A National Cancer Database Analysis. *Clinical Lymphoma, Myeloma and Leukemia*, 2019, Volume 19, Issue 5, 310 – 319.
44. Hu K, Yahalom J. Radiotherapy in the management of plasma cell tumors. *Oncology (Williston Park)*. 2000 Jan. 14(1):101-8.
45. Bataille R, Sany J. Solitary myeloma: clinical and prognostic features of a review of 114 cases. *Cancer*. 1981 Aug 1. 48(3):845-51
46. Holland J, Trenkner DA, Wasserman TH, Fineberg B. Plasmacytoma. Treatment results and conversion to myeloma. *Cancer*. 1992 Mar 15. 69(6):1513-7.
47. Yadav U, Kumar SK, Baughn LB, et al. Impact of cytogenetic abnormalities on the risk of disease progression in solitary bone plasmacytomas. *Blood*. 2023 Nov 30. 142 (22):1871-1878
48. Frechette, K.M. et al. Radiotherapy Outcomes in Solitary Plasmacytoma with High-Risk Cytogenetic Abnormalities .*International Journal of Radiation Oncology, Biology, Physics*, 2024,Volume 120, Issue 2, e623
49. Fouquet G, Guidez S, Herbaux C, Van de Wyngaert Z, Bonnet S, Beauvais D, Demarquette H, Adib S, Hivert B, Wemeau M, Berthon C, Terriou L, Coiteux V, Macro M, Decaux O, Facon T, Huglo D, Leleu X. Impact of initial FDG-PET/CT and serum-free light chain on transformation of conventionally defined solitary plasmacytoma to multiple myeloma. *Clin Cancer Res*. 2014 Jun 15;20(12):3254-60.
50. Paiva B, Chandia M, Vidriales MB, Colado E, Caballero-Velázquez T, Escalante F, Garcia de Coca A, Montes MC, Garcia-Sanz R, Ocio EM, Mateos MV, San Miguel JF. Multiparameter flow cytometry for staging of solitary bone plasmacytoma: new criteria for risk of progression to myeloma. *Blood.* 2014 Aug 21;124(8):1300-3.

 doi:10.20944/preprints202504.1781.v1