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Volumetric Modulated Arc Therapy for a Rare Solitary Extramedullary Plasmacytoma of the Nasopharynx: Clinical and Technical Insights

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Abstract **Case Report**

Solitary extramedullary plasmacytoma (SEP) of the nasopharynx is an exceptional entity within upper aerodigestive tract plasma cell neoplasms. We report the case of a 38-year-old previously healthy male who was referred with a two-year history of progressive bilateral nasal obstruction without other regional or systemic symptoms. Nasopharyngeal magnetic resonance imaging (MRI) revealed a well-circumscribed, 38-mm expansile soft-tissue mass localized to the nasopharynx with intact pharyngobasilar fascia and no evidence of cervical lymphadenopathy. Endoscopic biopsy demonstrated a dense plasma cell proliferation with kappa light-chain restriction on immunohistochemistry (positive for CD138, CD56, and MUM1; negative for AE1/AE3, CD68, CD20, and CD3), establishing a diagnosis of nasopharyngeal plasmacytic proliferation with kappa monotypia. Staging with whole-body 18F-FDG PET/CT revealed a solitary hypermetabolic focus (maximum standardized uptake value of 9.8) restricted to the nasopharyngeal mass. biological workup and bone marrow analysis ruled out systemic plasma cell myeloma. A multidisciplinary tumor board recommended definitive external-beam radiotherapy using volumetric modulated arc therapy (VMAT) with daily onboard cone-beam computed tomography (CBCT) guidance to a total dose of 50 Gy in 25 fractions, intentionally omitting elective cervical nodal irradiation. The treatment was completed as planned without interruption or significant toxicity. Twelve weeks post-treatment, follow-up 18F-FDG PET/CT confirmed a complete metabolic response. Definitive fractionated radiotherapy using modern conformal techniques such as VMAT achieves excellent local control and complete metabolic response in localized nasopharyngeal SEP. Long-term structured surveillance remains imperative given the recognized risk of late systemic transformation to multiple myeloma.

Keywords: Definitive radiotherapy, nasopharynx, plasma cell neoplasm, solitary extramedullary plasmacytoma, volumetric modulated arc therapy.

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INTRODUCTION

Solitary extramedullary plasmacytoma (SEP) is a rare and distinct manifestation of plasma cell dyscrasias, accounting for approximately 3% of all plasma cell neoplasms [1]. While 80% to 90% of these lesions originate in the mucosa of the upper aerodigestive tract, primary nasopharyngeal involvement remains uncommon [2]. Given that such involvement within Waldeyer's ring is exceptional and primarily documented in isolated case reports, clinicians managing head and neck malignancies must maintain a high degree of clinical suspicion [3,4]. Because their presentation can mimic more common mucosal or neoplastic conditions, diagnosis is frequently delayed until the tumor reaches a significant size. This diagnostic challenge is often further complicated by the fact that cervical lymphadenopathy is observed in only 10% to 15% of head and neck SEP cases [3].

Establishing a diagnosis of SEP necessitates an integrated workup that concurrently confirms clonal plasma-cell proliferation and excludes systemic disease. Histopathological analysis of the biopsy specimen must demonstrate a monoclonal plasma-cell infiltrate, characterized by typical CD138/CD38 expression and kappa/lambda light-chain restriction [5]. Furthermore, bone marrow aspiration is required to ensure that plasma-

cell infiltration remains below the 10% International Myeloma Working Group (IMWG) diagnostic threshold, as values at or above this level support a diagnosis of multiple myeloma [5]. Finally, to confirm the lesion's genuinely solitary nature, whole-body imaging preferably 18F-fluorodeoxyglucose positron emission tomography/computed tomography (18F-FDG PET/CT) for extraosseous disease must reveal no additional lytic or extraosseous lesions, and clinical workup must verify the absence of hypercalcemia, renal insufficiency, anemia, and bone lesions (CRAB criteria) [4,6].

Owing to the high radiosensitivity of clonal plasma cells, definitive external-beam radiotherapy is the gold standard for treating localized disease [5]. International consensus, including National Comprehensive Cancer Network (NCCN) and International Lymphoma Radiation Oncology Group (ILROG) guidelines, prioritizes highly conformal irradiation as the primary therapeutic modality, consistently achieving robust local control rates between 79% and 91% [4,7]. Consequently, radiotherapy remains the cornerstone of management, providing favorable long-term outcomes for this rare clinical entity [5].

Given the rarity of this disease, we report a case of solitary extramedullary plasmacytoma of the nasopharynx managed at our institution in January 2026 and discuss its clinical presentation, diagnostic workup, and therapeutic management, with a particular emphasis on modern radiation therapy planning and delivery.

Case Presentation

A 38-year-old male with no significant medical or surgical history including no prior hematological disorders, immunosuppressive conditions, toxic exposures, or family history of malignancy was referred to the Department of Otorhinolaryngology in January 2026 for progressive bilateral nasal obstruction. The symptoms had begun insidiously approximately two years prior to presentation, with gradual worsening, and without accompanying audiological, hemorrhagic, or pain-related manifestations, or palpable cervical masses. The patient denied weight loss, asthenia, or constitutional symptoms, and the neurological examination revealed no cranial nerve deficits that would suggest skull base extension.

Flexible nasofibroscopy revealed a pink, polypoid mass within the nasopharynx, partially obstructing the rhinopharyngeal lumen. The remainder of the otorhinolaryngological examination was unremarkable; notably, there was no suspicious cervical lymphadenopathy on bimanual palpation and no abnormal findings on otoscopy. General physical examination was likewise noncontributory, with no reported weight loss.

Dedicated magnetic resonance imaging (MRI) of the nasopharynx and neck demonstrated a well-circumscribed, expansile soft-tissue mass of the nasopharynx measuring 38 mm along its longest axis localized to the nasopharynx (Figures 1A, 1B). The lesion exhibited intermediate signal intensity on T2-weighted sequences and diffusion-weighted imaging, and showed homogeneous post-contrast enhancement. The mass obstructed the rhinopharyngeal lumen and displaced adjacent structures, but the pharyngobasilar fascia remained intact, with no evidence of invasion into the skull base and no cervical lymphadenopathy.

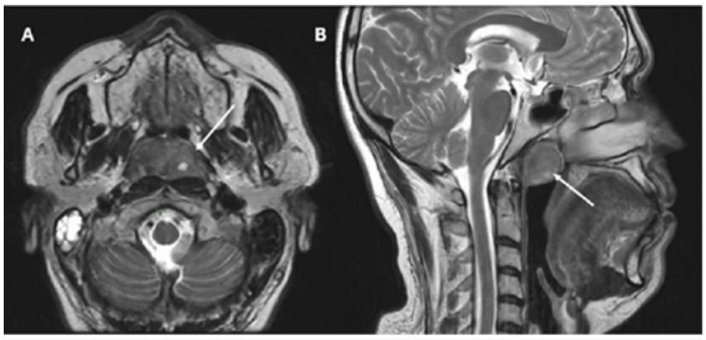


Figure 1: Baseline T2-weighted magnetic resonance imaging of the nasopharynx
(A) Axial and (B) sagittal T2-weighted magnetic resonance imaging (MRI) sequences demonstrating a well-circumscribed, 38-mm expansile soft-tissue mass within the nasopharynx (white arrows). The lesion exhibits characteristic intermediate T2 signal intensityand causes subtotal obstruction of the rhinopharyngeal lumen. There is strict preservation of the pharyngobasilar fascia, with no evidence of invasion into the skull base.

MRI: magnetic resonance imaging

Endoscopic biopsy of the nasopharyngeal mass was subsequently performed. Histopathological examination revealed respiratory-type mucosa with a dense, sheet-like proliferation of plasma cells, characterized by scant cytoplasm and monotonous, round nuclei with the typical "spoke-wheel" chromatin pattern, alongside scattered reactive small lymphocytes without atypia (Figure 2A). Although the morphology was suggestive of a plasma cell neoplasm, immunohistochemistry was required to confirm the

lineage and rule out key differential diagnoses, including undifferentiated nasopharyngeal carcinoma, lymphoplasmacytic lymphoma, marginal zone lymphoma with plasmacytic differentiation, and plasmablastic lymphoma. The neoplastic cells stained positive for CD138, CD56, and MUM1, firmly establishing a plasma cell.

lineage (Figure 2B). Negative staining for cytokeratins AE1/AE3 excluded an epithelial origin specifically undifferentiated nasopharyngeal carcinoma and the absence of CD68 expression ruled out histiocytic proliferation. Furthermore, CD20 and CD3 immunostaining highlighted only residual reactive B- and T- lymphocyte populations, excluding B-cell or T-cell lymphomas with plasmacytic differentiation. Kappa light chain restriction confirmed the clonal nature of the proliferation, resulting in a final diagnosis of nasopharyngeal plasmacytic proliferation with kappa monotypia.

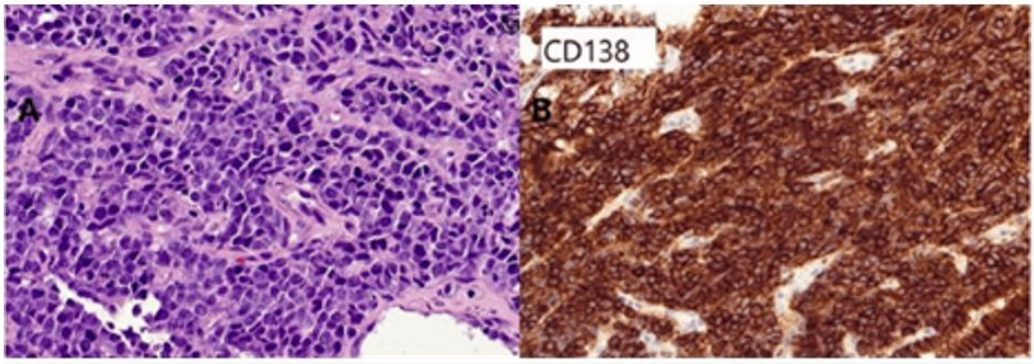


Figure 2: Histopathological and immunohistochemical features of the nasopharyngeal biopsy

(A) Hematoxylin and eosin (H&E) stain (original magnification x400) demonstrating a dense proliferation of neoplastic plasma cells characterized byeccentric, round nuclei with classic "spoke-wheel chromatin patterns, along with occasional cytological atypia. (B) Immunohistochemical analysis for CD138 (original magnification *400) showing strong, diffuse, and linear membranous immunoreactivity across the neoplastic cell population, firmly establishing the plasma cell lineage.

H&E: hematoxylin and eosin; CD138: cluster of differentiation 138

To distinguish between solitary extramedullary plasmacytoma (SEP) and multiple myeloma with secondary involvement, a comprehensive staging workup was performed. A whole-body 18F-fluorodeoxyglucose positron emission tomography/computed tomography (18F-FDG PET/CT) scan revealed intense hypermetabolism of the nasopharyngeal mass, with a maximum standardized uptake value of 9.8, and no pathologic uptake elsewhere, supporting a diagnosis of localized disease (Figure 3A, 3B, 3C).

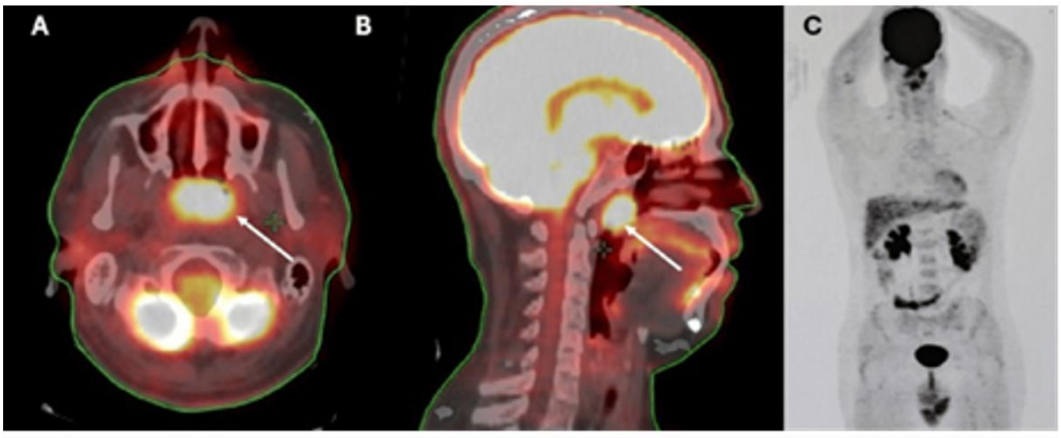


Figure 3: Baseline 18F-fluorodeoxyglucose positron emission tomography/computed tomography staging

(A) Axial and (B) sagittal fused 18F-fluorodeoxyglucose positron emission tomography/computed tomography (18F-FDG PET/CT) images demonstrating intense radiotracer avidity localized strictlyto the nasopharyngeal mass (white arrows). (C) Whole-bodymaximum intensityprojection (MIP) PET scan confirming physiological tracer distribution with no evidence of secondary skeletal or extraosseous pathologic hypermetabolism, establishing the strictly localized nature of the solitary disease.

18F-FDG PET/CT: 18F-fluorodeoxyglucose positron emission tomography/computed tomography, MIP: maximum intensity projection

Laboratory evaluation ruled out hypercalcemia, renal insufficiency, anemia, and bone lesions (CRAB criteria) [8]: the complete blood count was normal (hemoglobin: 13.6 g/dL), as were serum creatinine (0.9 mg/dL, with an estimated glomerular filtration rate of 94 mL/min/1.73 m²) and corrected serum calcium (88 mg/L). Additionally, serum albumin (45 g/L), liver function tests, and viral serologies were unremarkable, effectively excluding chronic hepatopathy or comorbid viral infections. Prognostic biomarkers were favorable, with serum beta-2-microglobulin (1.67 mg/L) and lactate dehydrogenase (166 U/L) both falling within normal ranges, consistent with a low tumor burden. Serum protein electrophoresis and immunofixation detected no monoclonal components. While the serum free light chain (sFLC) assay revealed free kappa chains at 42 mg/L and free lambda chains at 23 mg/L (kappa/lambda ratio: 1.82), bone marrow aspiration showed only 2% plasma cells, and bone marrow analysis comprising both karyotyping and fluorescence in situ hybridization (FISH) revealed no cytogenetic abnormalities.

The diagnosis of solitary extramedullary plasmacytoma of the nasopharynx was confirmed through the integration of clinical, radiological, histopathological, and laboratory findings. The case was subsequently evaluated by a multidisciplinary tumor board including experts in otorhinolaryngology, radiation oncology, hematology, radiology, and pathology who recommended exclusive curative radiotherapy as the optimal therapeutic strategy.

Upon admission to the Department of Radiation Oncology, the patient presented in good general condition, fully active without physical limitations, and with satisfactory oral health. Clinical examination confirmed the nasopharyngeal mass, showing no palpable laterocervical lymphadenopathy or signs of locoregional progression. For treatment planning, a simulation CT scan was acquired with the patient in a supine position, utilizing a five-point thermoplastic mask for head, neck, and shoulder immobilization. Following institutional protocol, the scan extended from the vertex to 2 cm below the sternoclavicular joint with a 3-mm slice thickness. Image registration with the diagnostic nasopharyngeal MRI and 18F-FDG PET/CT dataset enabled precise delineation of the macroscopic disease (gross tumor volume [GTV]). The clinical target volume (CTV) was generated by an isotropic 5-mm expansion of the GTV, encompassing the entire nasopharynx, with no prophylactic irradiation of the cervical nodal stations. The planning target volume (PTV) was subsequently constructed by an additional 4-mm expansion of the CTV to account for setup uncertainties and interfraction motion, in accordance with institutional practice (Figure 4A, 4B). A total dose of 50 Gy was administered in 25 fractions of 2 Gy, five days per week, using volumetric modulated arc therapy (VMAT) on a linear accelerator equipped with onboard cone-beam computed tomography (CBCT) for image-guided radiotherapy. The treatment was completed as prescribed. During irradiation, the patient developed mild oral mucositis, which was managed conservatively without requiring interruption or modification of the fractionation schedule.

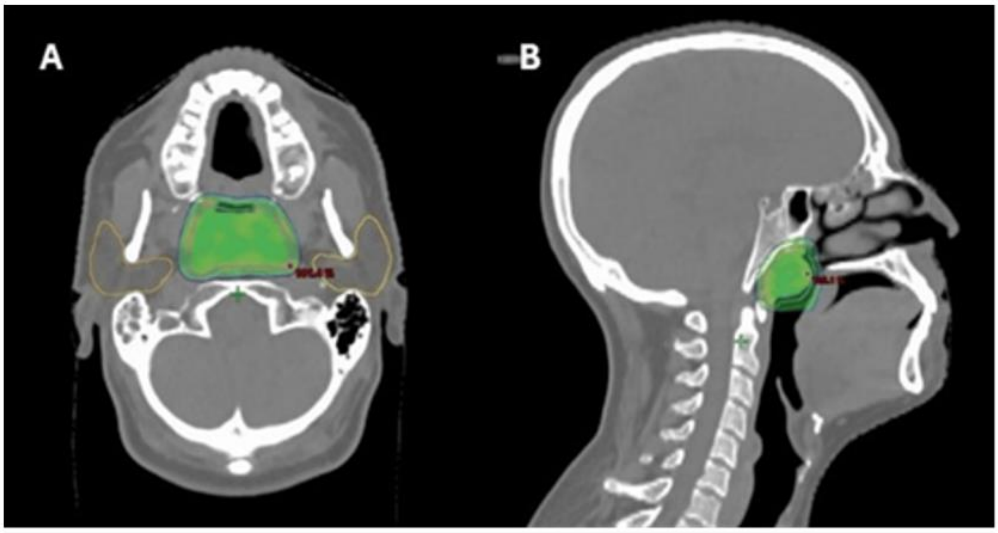


Figure 4: Volumetric modulated arc therapy dose distribution and target volume coverage
(A) Axial and (B) sagittal planning computed tomography views demonstrating volumetric modulated arc therapy (VMAT) dose distribution. The clinical target volume (CTV 50) is delineated by the magenta contour, and the planning target volume (PTV 50) is delineated bythe cyan contour. Bilateral parotid glands are outlined in yellow. The green color wash displays the 95% isodose volume, illustrating optimal target coverage with steep dose fall-off toward adjacent critical structures.

CT: computed tomography, VMAT: volumetric modulated arc therapy, CTV: clinical target volume; PTV: planning target volume

An early clinical response was evidenced by the progressive alleviation of nasal obstruction during the initial weeks of treatment, while end-of-treatment cone-beam computed tomography demonstrated a substantial reduction in tumor volume. Twelve weeks following the completion of radiotherapy, 18F-FDG PET/CT confirmed a complete metabolic response. The patient was subsequently enrolled in a structured, long-term surveillance program.

DISCUSSION

Solitary extramedullary plasmacytoma is a localized plasma-cell neoplasm accounting for roughly 3% of all plasma-cell dyscrasias [1], with the upper aerodigestive tract predominantly the nasal cavity, paranasal sinuses, oropharynx, and nasopharynx involved in approximately 80% to 90% of cases [2]. Nasopharyngeal solitary extramedullary plasmacytoma (SEP) is exceptionally rare, documented essentially through isolated case reports [9]. This rarity is precisely what our observation illustrates. A 38-year-old previously healthy male was referred in January 2026 after a two-year history of progressive bilateral nasal obstruction without associated symptoms. The presentation was therefore atypical in its absence of the alarm features that usually grade the disease. Such paucity of mass-related symptoms illustrates how readily nasopharyngeal SEP is delayed or confused with more common mucosal or neoplastic pathologies, frequently resulting in diagnostic delay [10].

The diagnosis of SEP and its distinction from multiple myeloma rests on a tripartite workup combining histopathology, biology, and imaging: a biopsy demonstrating monoclonal plasma-cell infiltration with light-chain restriction, bone marrow examination showing <10% plasma cells without clonal proliferation, and whole-body imaging excluding additional lytic lesions [4]. In our patient, the endoscopic biopsy returned a sheet-like proliferation of mature plasma cells with kappa light-chain restriction, immunohistochemistry confirming the lineage (CD138+, CD56+, MUM1+) while excluding undifferentiated nasopharyngeal carcinoma (AE1/AE3−), histiocytic proliferation (CD68−), and B- or T-cell lymphoma (CD20−/CD3−). 18F-fluorodeoxyglucose positron emission tomography/computed tomography (18F-FDG PET/CT) documented a single hypermetabolic focus (maximum standardized uptake value [SUVmax]: 9.8) without any other pathologic uptake, biological workup ruled out CRAB criteria (hemoglobin: 13.6 g/dL, estimated glomerular filtration rate [eGFR]: 94 mL/min/1.73 m², corrected calcium: 88 mg/L), bone marrow aspiration showed 2% plasma cells with normal fluorescence in situ hybridization (FISH), and serum protein electrophoresis/immunofixation detected no monoclonal component the mildly elevated kappa/lambda ratio of 1.82 being interpreted as a non-clonal bias given the otherwise strictly normal workup [4,5]. This sequence of endoscopic biopsy, 18F-FDG PET/CT, full biology, bone marrow examination, and cross-sectional magnetic resonance imaging (MRI) aligns with diagnostic principles for confirming localized SEP before radiotherapy decisions, as outlined in guidelines such as the International Lymphoma Radiation Oncology Group (ILROG) consensus and National Comprehensive Cancer Network (NCCN) Guidelines v5.2026 [4,6].

The strategy selected at the multidisciplinary tumor board was exclusive external-beam radiotherapy with curative intent, in accordance with the international standard for localized solitary extramedullary plasmacytoma [4]. The 2018 ILROG guidelines and the NCCN Guidelines v5.2026 identify radiotherapy as the definitive treatment of reference for head and neck SEPs. Radiotherapy as the sole modality achieves local control rates of 90% to 100% [11].

Complete surgical excision is theoretically curative for small, accessible SEPs in anatomically unconstrained territories, but was not feasible in our case given the deep nasopharyngeal location, the high probability of positive surgical margins, and the disproportion between surgical morbidity and oncological benefit. The recent systematic review and meta-analysis by Vasudevan et al. confirms that radiotherapy achieves significantly lower rates of progression to multiple myeloma and better five-year disease-free survival than surgery alone [12].

Systemic therapy lacks a curative role in truly localized SEP, for which definitive radiotherapy alone remains the standard [4,5]. As the European Expert Panel and the ILROG consensus do not routinely recommend adjuvant chemotherapy, citing a lack of definitive evidence for superior outcomes compared to radiotherapy alone [4,5], systemic treatment is conventionally deferred until documented progression to multiple myeloma.

Given the curative intent, radiotherapy in the nasopharyngeal region demands high ballistic precision. In our practice, this was achieved by administering a total dose of 50 Gy in 25 fractions of 2 Gy. To manage the complex anatomy of the cavum, treatment was delivered using volumetric modulated arc therapy (VMAT) with onboard cone-beam computed tomography (CBCT) guidance, ensuring precise target delineation and coverage while optimizing the sparing of surrounding healthy tissues.

The optimal radiation dose for solitary extramedullary plasmacytoma remains one of the most debated questions in radiation oncology of plasma cell neoplasms, because available evidence is essentially limited to retrospective series with small sample sizes and narrow dose ranges [4].

A first body of work supports a flat dose-response above a relatively low threshold. Ozsahin et al.

the largest multicenter pooled series (n = 258, comprising n = 206 solitary bone plasmacytoma [SBP] and n = 52 extramedullary plasmacytoma [EMP]) demonstrated no benefit of doses greater than 30 Gy regardless of tumor size [13], and the recent multicenter cohort of Elsayad et al. (n = 84, 2000-2019, median dose 42 Gy, range 36-59.4 Gy) reported that radiotherapy dose escalation did not lead to a significant effect on myeloma-free, progression-free, or overall survival [11]. A parallel body of work identifies a clinically meaningful benefit at higher thresholds. Mendenhall et al. reported a local control rate of 94% with 40 Gy or above, compared with 69% for doses lower than 40 Gy [4]. At the population scale, the National Cancer Database analysis of Saba et al. (n = 6,579, 2004-2017) found that the use of a radiation dose ≥37 Gy was associated with better outcomes [14], and a subsequent age-stratified US cohort study (n = 9,427, 73% SBP) found median overall survival varied significantly based on radiation dose, suggesting 45-50 Gy may confer better survival than lower doses [15].

Despite these apparently conflicting data, current international guidelines have converged on a pragmatic, size-adapted approach. The European Expert Panel recommends fractionated radiotherapy at 40-50 Gy over approximately four weeks, at 1.8-2.0 Gy per fraction [5]. The ILROG consensus and the NCCN Guidelines align with this framework, recommending a minimum radiation dose of 40 Gy for the definitive treatment of extramedullary plasmacytoma [4]. While the therapeutic range of 40-50 Gy, administered in 1.8-2.0 Gy daily fractions, is standard, a lack of dose-response relationship above 35 Gy has been reported for small tumors, and sporadic local failures have been observed even at doses of 50-60 Gy [4].

Target volume delineation was based on image fusion of the planning CT with the diagnostic nasopharyngeal MRI and 18F-FDG PET/CT datasets, in accordance with clinical practice. Regarding margins, NCCN guidelines recommend an axial gross tumor volume (GTV)-to-clinical target volume (CTV) expansion of at least 0.5 cm in soft tissues, and up to 2-3 cm for long bones [6]. Our selection of a 0.5-cm margin is conservative, yet it falls within the lower bound of the recommended range [6]. This prudent approach is justified by the tumor's strict localization to the nasopharynx and the precise boundary definition afforded by the MRI/18F-FDG PET/CT fusion.

The question of whether to irradiate the cervical nodal stations electively in head-and-neck solitary extramedullary plasmacytomas is particularly acute for nasopharyngeal primaries, since it directly shapes both the irradiated volume and the expected toxicity profile. Before the advent of conformal radiotherapy and modern imaging, prophylactic cervical coverage was routine and regional nodal failures were rarely reported [4]. The contemporary dominant position rests on the explicit demonstration by Michalaki et al. in their retrospective series of ten patients treated between 1982 and 2001 that a 10% cervical nodal relapse rate does not justify elective irradiation of an uninvolved neck [16]. The recent literature reports that head-and-neck EMPs spread to cervical lymph nodes in roughly 10% to 15% of cases overall [17], without meaningful sub-localization data within Waldeyer's ring.

The ILROG panel formulates a restrictive recommendation: elective nodal irradiation is not required for head-and-neck SEPs unless persuasive clinical evidence indicates a high nodal risk, such as very bulky primary disease [4]. For SEPs arising specifically from Waldeyer's ring structures including the nasopharynx the guidance is even more explicit: when optimal imaging is available and demonstrates no cervical nodal involvement, intentional prophylactic nodal coverage is not recommended [4]. Our case met all clinical criteria for a strict application of this recommendation: no cervical lymphadenopathy on physical examination, no suspicious nodes on nasopharyngeal and cervical MRI, and 18F-FDG PET/CT confirming the absence of any hypermetabolic lymph node involvement. The omission of elective cervical irradiation therefore constituted a rational therapeutic de-escalation-reduced irradiated volume without compromise of regional control.

Regarding the radiation technique, the clinical benefits of intensity-modulated radiation therapy (IMRT) and VMAT over conventional three-dimensional conformal radiation therapy (3D-CRT) are now supported by multicenter data from Elsayad et al.; across 84 patients, the use of modern irradiation techniques was associated with a trend toward higher local control and significantly lower rates of local recurrence [11]. Conversely, the absence of randomized, direct comparative trials between VMAT, IMRT, and 3D-CRT for solitary plasmacytomas remains a recognized limitation [4]. Our choice, however, aligns with contemporary practices at expert centers, where IMRT and VMAT are often appropriate for head and neck SEPs a decision particularly relevant in a young patient with a potentially long post-therapeutic life expectancy [4]. The ILROG guidelines state that "treatment techniques used in the treatment of head and neck cancer are often appropriate for SP/MM in the same locations" because of the highly conformal dose distribution and sparing of adjacent structures [4].

Definitive radiation therapy achieves favorable oncologic outcomes in nasopharyngeal solitary extramedullary plasmacytoma, with prior retrospective studies including a 55-patient EMP cohort (70.9% head-and-neck locations) reporting a five-year local recurrence-free survival of 79.8% and overall survival of 76.0%, in line with the 79% to 91% long-term local control range consolidated by the ILROG consensus [4,18]. A European Expert Panel review of 191 patients

corroborates this favorable course for the extramedullary subgroup specifically, with an overall survival of 51% at eight years and a progression-free survival of 94% at two years [5]. For nasopharyngeal SEP in particular, when modern staging-combining MRI and 18F-FDG PET/CT, which detects subclinical nodal disease in approximately 25% of cases [4]-confirms truly localized disease, exclusive radiotherapy is regarded as potentially curative [3].

Prognosis is nevertheless tempered by the recognized risk of late recurrence and systemic dissemination, with transformation to multiple myeloma occurring in 50% of solitary bone plasmacytomas and 15% of extramedullary plasmacytomas up to 15 years after diagnosis, even after apparently curative irradiation [18]. Prolonged and structured follow-up therefore remains essential to detect late progression early and to preserve the intrinsically favorable prognosis of adequately irradiated nasopharyngeal SEP [4,18].

CONCLUSIONS

Solitary extramedullary plasmacytomas are a rare subtype of plasma cell dyscrasia that most commonly arise in the head and neck. Head-and-neck extramedullary plasmacytomas are highly radiosensitive, and international guidelines recommend fractionated radiotherapy as definitive treatment, achieving local control rates of 90-100%. In the present nasopharyngeal case, treatment with VMAT resulted in a complete response.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work. Acquisition, analysis, or interpretation of data: EM, MH, NL, Drafting of the manuscript: EM, Critical review of the manuscript for important intellectual content: MB, AM, IL, KA, KH, Supervision: ME

Conflicts of Interest: The authors declare that there are no conflicts of interest regarding the publication of this paper.

Ethical Approval: As this is a case report, formal ethical committee approval is not required by our institution, provided that anonymity is maintained and consent is obtained. The study was conducted in accordance with the Declaration of Helsinki.

Patient Consent Declaration: Informed consent was obtained from the patient's next of kin for the publication of this case report and accompanying images. The patient's identity has been fully anonymized, and no specific identifying details are included in the manuscript.

Authors' contributions

EM, MH, NL: Conceptualization, literature search, clinical data acquisition, manuscript drafting, and editing. MB, IL and KA: Participation in the clinical management of the patient, data analysis, and manuscript review. KH and ME: Supervision, critical revision of the manuscript for important intellectual content, and final approval of the version to be published. All authors read and approved the final manuscript.

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