

Management Strategies for Osseous Follicular Lymphoma of the Spine

David Gomez ¹, Jason Lin ², Priya Rajagopalan ¹, Sarmen Sarkissian ³, Michael M. Safaee ¹

Review began 05/25/2026

Review ended 06/14/2026

Published 06/16/2026

© Copyright 2026

Gomez et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

DOI: 10.7759/cureus.110985

1. Department of Neurological Surgery, University of Southern California Keck School of Medicine, Los Angeles, USA 2. Department of Neurological Surgery, University of California Los Angeles David Geffen School of Medicine, Los Angeles, USA 3. Department of Oncology, Oceanview Medical Specialists, Ventura, USA

Corresponding author: Jason Lin, jalin@mednet.ucla.edu

Abstract

Primary spinal lymphoma accounts for less than 1% of spine tumors. Follicular lymphoma (FL), the most common indolent non-Hodgkin subtype, rarely involves the spine. Its indolent nature may delay diagnosis and require collaborative efforts to address diagnostic ambiguity, structural instability, and treatment.

A 33-year-old male was transferred to our center with several months of progressive left leg pain and foot weakness in an L5/S1 distribution. History was notable for a sacral laminectomy four years prior for an epidural lesion diagnosed as a benign calcifying tumor with no subsequent adjuvant therapy or follow-up. Examination revealed mild left dorsiflexion and plantarflexion weakness, with intact rectal tone and sensation. Imaging demonstrated an enhancing lesion involving the L5 vertebral body with epidural extension from L5 to S1. CT-guided biopsy suggested lymphoma and was followed by surgical debulking and stabilization. Final pathology confirmed FL, and the patient received adjuvant bendamustine/rituximab with remission evidenced by resolution of pretreatment hypermetabolic foci on PET-CT with improved leg pain, strength, and absence of active disease at one-year follow-up.

This case underscores the clinical and diagnostic challenges of FL. Barriers to timely adjuvant therapy heighten risks and underscore imperatives for multidisciplinary collaboration and close follow-up. Surgeons should typically advocate for biopsy or open surgery for a definitive diagnosis, stabilize fractures when necessary, and integrate oncology and radiation oncology input.

Categories: Neurosurgery

Keywords: extradural, follicular, lymphoma, osseous, primary, spine, surgical

Introduction

Primary spinal lymphoma (PSL) is a rare malignancy, accounting for <1% of spinal tumors [1,2]. Follicular lymphoma (FL) represents <5% of PSL cases, and its indolent nature contributes to underdiagnosis [1-3]. Its defining molecular event is the t(14;18)(q32;q21) translocation, and tumor cells retain a germinal center immunophenotype (CD20+, CD10+, and BCL6+) with aberrant BCL2 expression. This biology means that FL is predominantly nodal, and primary osseous involvement of the vertebral column is rare. Further, the low proliferative fraction, together with the dense reactive fibrosis that these lesions can elicit, may obscure cytologic atypia and clonality on limited sampling, thus allowing indolent spinal FL to mimic benign processes and delay definitive diagnosis. Neurological compromise in spinal FL can arise either through direct epidural soft-tissue extension compressing the cord or cauda equina, or secondarily through structural instability and pathologic fracture resulting from osseous destruction. Diagnosis relies on radiographic imaging and tissue biopsy, ideally before corticosteroid administration [4,5]. Management involves chemotherapy, radiation, and surgery for diagnosis or neural decompression [4,6,7]. However, PSL's rarity and non-specific presentation complicate diagnosis, and balancing urgent surgical intervention with timely adjuvant therapy poses additional complexity.

We present a rare case of follicular PSL (FPSL) in a 33-year-old male presumed to be a benign lumbosacral mass, causing delayed treatment, progressive extradural and osseous disease, and multiple surgeries for decompression and stabilization. Recurrence highlights the need for early suspicion, definitive biopsy, and multidisciplinary management.

Clinical data (imaging, histopathology, operative records, and oncology consultations) were retrospectively analyzed. Imaging was reviewed by a neuroradiologist, operative reports by the attending neurosurgeon, and adjuvant management by the attending oncologist.

Case Presentation

A 33-year-old male presented with a three-month history of progressive low back/buttock pain radiating down the left posterior thigh and foot, consistent with an S1 radiculopathy. Neurologic examination was

How to cite this article

Gomez D, Lin J, Rajagopalan P, et al. (June 16, 2026) Management Strategies for Osseous Follicular Lymphoma of the Spine. Cureus 18(6): e110985. DOI 10.7759/cureus.110985

notable for mild foot weakness with 4/5 strength in the tibialis anterior/EHL and 3/5 in the gastrocnemius, and normal rectal tone and perianal sensation. Post-void residual was normal. The patient's baseline performance status was ECOG 1, and the CTCAE neutropenia grade was 4. Pathology showed dense fibrous proliferation with mixed T-/B-lymphoid infiltrates, atrophic germinal centers, and focal calcification. Ancillary studies were negative. Flow cytometry identified no clonal B-/T-cell populations. With no evidence of malignancy, infection, or IgG4-related disease, a diagnosis of benign calcifying fibrous tumor ("pseudotumor") was made without adjuvant therapy. Lumbar MRI with and without contrast demonstrated a contrast-enhancing lesion involving the L5 vertebral body with epidural extension tracking down to the middle of S1, causing severe stenosis (solid arrow, Figures 1A-1F). On careful review, we noted a separate, slightly more avidly enhancing epidural lesion extending from the middle of S1 down to S4 (dashed arrow, Figures 1A-1F). Lumbar CT showed a relatively well-preserved vertebral body, although there was bony erosion of the left pedicle with partial extension into the proximal body and slight deformity of the superior endplate of L5 (Figures 1G-1I). There was also scalloping of the dorsal sacral body from S1 down, suggestive of a chronic process causing bony remodeling. The L4/5 and L5/S1 facet joints were not displaced, and standing X-rays showed grossly normal alignment. Urgent CT-guided biopsy found atypical lymphoid proliferation suggestive of lymphoma but was inconclusive. Of note, this patient had similar symptoms over a year prior and underwent imaging at the time that showed an enhancing T1 isointense/T2 hyperintense epidural mass from S1 to S4 with dorsal bony sacrum scalloping and subsequently underwent S1-S4 laminectomy for neural decompression and tissue diagnosis.

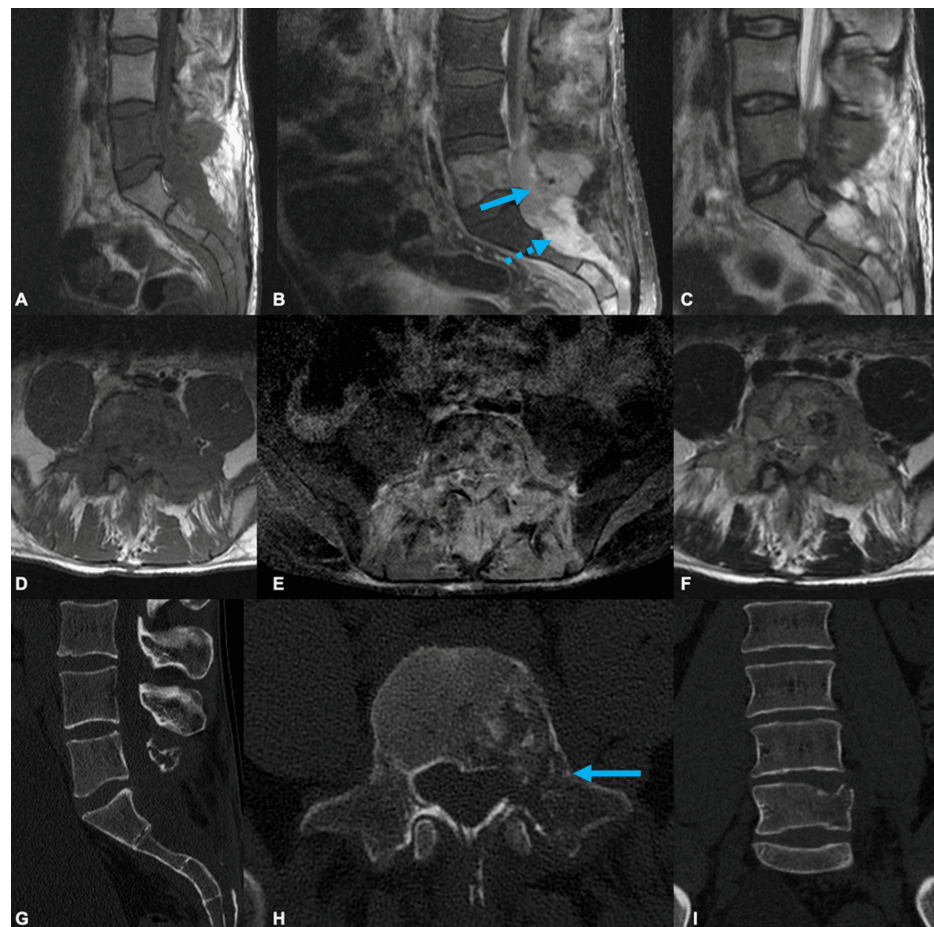


FIGURE 1: Preoperative imaging of L5 primary spinal lymphoma

Sagittal T1 pre-contrast (A), post-contrast (B), and T2 MRI (C), along with L5 axial T1 pre-contrast (D), T1 post-contrast (E), and T2 MRI (F), show an enhancing epidural lesion from L5 to S1 causing severe compression of the cauda equina with additional enhancement of the L5 vertebral body. In panel (B), the solid arrow depicts the epidural tumor, and the dotted arrow depicts the more avidly enhancing previous epidural lesion. Panels (G), (H), and (I) depict the corresponding CT. The solid arrow in panel (H) points toward erosion of the L5 pedicle. There is more avid enhancement of the sacral nerve roots from S2 down that is consistent with his history of prior S1-S4 laminectomy for what was described as a benign calcifying fibrous tumor.

Multidisciplinary review (neurosurgery, oncology, and radiation oncology) concluded that the L5 lesions were likely new entities, while the S1-S4 lesions were either scar or recurrent disease. Discordant histopathology and worsened neural compression prompted open resection for decompression and definitive tissue sampling. Preoperative Spinal Instability Neoplastic Score of 9 indicated "indeterminate

stability” (0-6 stable, 7-12 indeterminate, and 13-18 unstable). Stabilization was recommended but not pursued per patient request and was supported by minimal axial pain and preserved alignment.

A revision L4-S3 decompression was performed through the prior midline incision via L4-S1 laminectomy. The firm, fibrous epidural lesion was dissected off the dura and removed down to the prior laminectomy defect (Figure 2). The residual lower sacral lesion was denser and adherent to dura, precluding safe separation from lower sacral nerve roots. Given that the frozen intraoperative specimen was consistent with lymphoma and likely radiosensitive, residual tumor was left to avoid injury. Final histopathology confirmed FPSL (CD20+, CD10+, BCL2+; grade 1-2, Ki-67 10%-15%) (Figure 3).

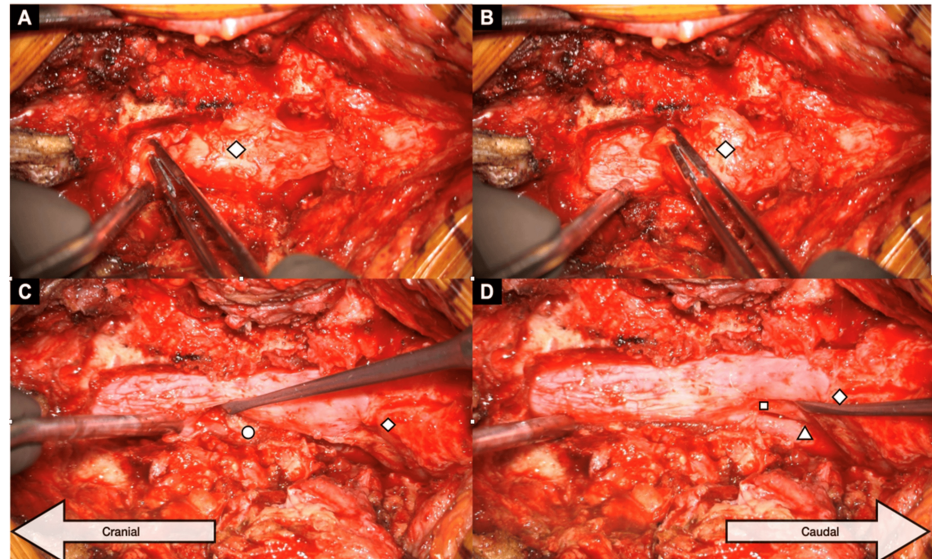


FIGURE 2: Intraoperative images of tumor dissection

Stepwise intraoperative view depicting resection of L5 epidural tumor. The tumor (diamond) was dorsally based and adherent to the thecal sac (A), but with careful microdissection, it was peeled off the dura and retracted caudally (B) by following the interface between the tumor and dura. After tumor resection and debulking, the L5 (circle) (C), S1 (triangle), and S2 (square) (D) roots were well decompressed.

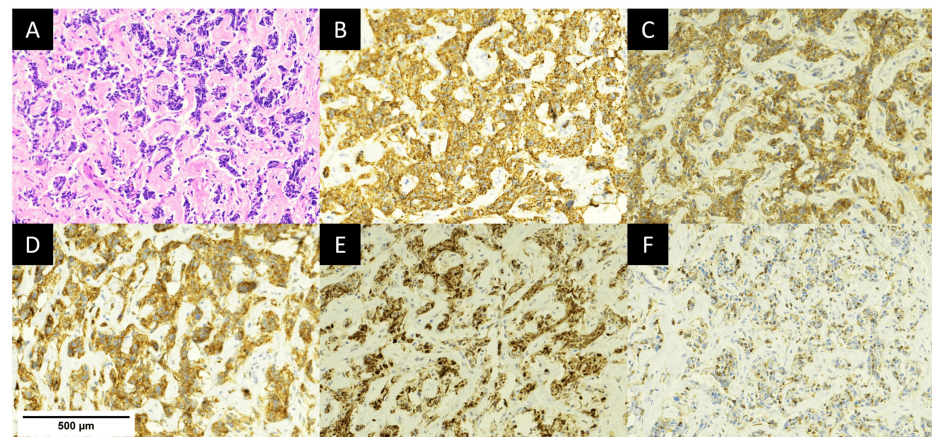


FIGURE 3: Histopathological images of the lumbosacral lesion

Images were captured at 200x magnification and stained with H&E (A), CD20 (B), CD21 (C), CD10 (D), BCL6 (E), and BCL2 (F).

CD, cluster of differentiation; H&E, hematoxylin and eosin.

Ultrasound confirmed decompression of the thecal sac from L4-S3, L4/5, and L5/S1 facets remained intact without evidence of instability, and motor-evoked potentials improved in the left tibialis anterior. There was no obvious instability or hypermobility at L4/5 or L5/S1 intraoperatively. Postoperative MRI showed good decompression of the thecal sac. After an uncomplicated recovery with improved leg strength and

urinary function, plans for chemotherapy/radiation at three weeks postoperatively were made. Initiation of adjuvant therapy was delayed by barriers at two levels: diagnostic, owing to the initial misclassification as a benign pseudotumor, and patient-level social and financial constraints that prevented timely initiation of the planned chemoradiation. Five weeks postoperatively, he returned with intractable pain, inability to stand, and erosion of the L5 vertebral body consistent with worsening L5 pathologic fracture. Urinary function was not formally assessed at this visit. Percutaneous L4-S1 fixation with right-sided L4/5, L5/S1 facet arthrodesis and L5 cement augmentation was performed. Augmentation was complicated by extraversion into the disc space, which was halted once identified on intraoperative fluoroscopy. There was no postoperative neurological sequela or radiculopathy, and the patient has remained asymptomatic from this cement extravasation throughout follow-up, now nearly three years out from surgery. Right L4-5/L5-S1 facet arthrodesis was achieved via tubular decortication with allograft and demineralized bone matrix.

Post-stabilization, the patient completed six cycles of bendamustine (90mg/m² on days1-2) plus rituximab (375mg/m² on day1), with pegylated filgrastim support, complicated by one episode of non-infectious neutropenia -- without treatment delay. He also received local radiation (40Gy x 16 fractions/21 days) using volumetric arc therapy with 10MeV X-rays. Post-chemotherapy, PET/CT demonstrated complete resolution of hypermetabolic activity (pre-treatment SUV_{max} 10.2 at L5 and 25.1 in the left hemisacrum) (Figure 4). Of note, only the L5 bony and epidural showed FDG uptake, whereas the prior epidural calcifying pseudoneoplasm showed no hypermetabolic activity. Maintenance rituximab every eightweeks was initiated.

Discussion

Literature on PSL with osseous involvement is limited, with existing literature primarily consisting of case reports and small series. A systematic literature review was conducted using PubMed and Cochrane Libraries for articles published from January 2010 to January 2024, employing MeSH terms: “Spinal Neoplasms”, “Lymphoma”, “Extradural”, “Osseous”, and “Pathologic Fracture.” Inclusion prioritized PSL, excluding secondary or metastatic disease. Two independent reviewers screened titles and abstracts, followed by full-text analysis to extract relevant patient data. Discrepancies were resolved by consensus. The patient consented to share his case details, and Institutional Review Board approval was not required. These lesions predominantly affect the thoracic and lumbar spine and are most frequently aggressive B-cell lymphomas in origin, with the most common subtype being diffuse large B-cell lymphoma (DLBCL) [2,8-13]. Management involves multimodal therapy tailored to neurological status and spinal stability, often combining surgical decompression with stabilization alongside adjuvant systemic chemotherapy. The most common chemotherapy regimen is cyclophosphamide, doxorubicin hydrochloride (hydroxydaunorubicin), vincristine sulfate (Oncovin), and prednisone (CHOP) with or without rituximab (R-CHOP). Outcomes are notably heterogeneous; while some patients achieve durable remission, overall survival has been reported at rates of around 7.2 months in some series [8].

FL (FPSL), an indolent subtype, represents only a small fraction of these osseous PSL cases. Consequently, high-quality evidence guiding optimal management specifically for spinal FPSL is scarce, and follow-up durations across studies vary. Our literature review identified only seven previously reported patients with FL specifically, providing minimal data to support specific adjuvant regimens beyond the historically used CHOP-based therapies (Table 1) [2,8]. These seven cases fall within a broader group of 35 patients with osseous PSL across the seven studies in Table 1, the majority of whom had other histologies (predominantly DLBCL). This paucity of specific treatment data for spinal FPSL is significant, particularly considering the efficacy of newer systemic agents such as rituximab combined with bendamustine (R-B) for FL generally, which is demonstrated in our case by recovery even with extensive bone involvement and multiple surgeries.

Author/year	Number of patients	Presenting symptoms	Location	Management	Outcome
Smith 2010 [12]	N=1; ALTL	Fever, night sweats, and weight loss. Bilateral UE pain/paresthesia/weakness	C7-T2	Anterior decompression and instrumented fusion (C5–C7); CHOP/radiotherapy	Remission at one-year with symptomatic improvements
Tsukamoto 2024 [13]	N=1; B-NHL	Chest and back pain, and bilateral lower extremity weakness	T4-T5	Posterior decompression (x3) and instrumentation (T2-T8); mini-R-CHOP (two cycles)	Recurrence at 1.5 months following initial decompression, then recurrence at three weeks after the second surgery
Dar 2013 [11]	N=1; DLBCL	Fever, night sweats, back pain, lower limb weakness, and urinary retention	T11-L1	Stabilization and decompression (T11-L1); CHOP/etoposide/radiotherapy	Remission at follow-up (timeframe not specified)
Mohammed 2021 [10]	N=1; B-NHL	Lower limb weakness, numbness, and bladder and bowel incontinence	T4-T7	Decompression, (T3-T7); declined adjuvant therapy	Development of stage IV disease, resulting in death (time unspecified)
Safaei 2023 [9]	N=1; DLBCL	Severe low back pain/weakness, urinary retention, and constipation	L3-L4	Decompression and instrumented fusion (L2-L4); R-CHOP (six cycles)/radiotherapy (40 Gy/22 sessions)	Remission at eight-month follow-up with symptomatic improvement and negative staging
Barz 2021 [8]	N=27; 18 DLBCL, 4 FL, and 5 other	Pain, neurological deficit, and/or signs of spinal instability	Thoracic (16), lumbar (8), and junctional (3)	Chemotherapy alone (12), radiotherapy alone (3), unknown (5), and no treatment (2)	Median overall survival 7.2 months, seven deaths reported during follow-up
Sarro 2024 [2]	N=3; FPSL	Back pain; mild neurologic deficits from spinal/nerve compression	N=1, multiple levels (unspecified); N=1, L5-L6; N=1, L5/iliac	N=1, chemotherapy/radiation; N=1, chemotherapy only; N=1, chemotherapy (incomplete)	N=2, remission at 76 months; N=1, death from unrelated malignancy (27 months)

TABLE 1: Selected studies of primary spinal lymphoma with osseous involvement

ALTL, anaplastic large T-cell lymphoma; B-NHL, B-cell non-Hodgkin lymphoma; CHOP, cyclophosphamide, doxorubicin (hydroxydaunorubicin), vincristine (Oncovin), and prednisone; DLBCL, diffuse large B-cell lymphoma; FL, follicular lymphoma; FPSL, follicular primary spinal lymphoma; R-CHOP, rituximab + CHOP; UE, upper extremity.

Overall, PSL is a rare clinical entity, often presenting as extradural disease, with FPSL being an underrecognized indolent variant [5-7,9,14]. This report of lumbosacral FPSL with extensive extradural and osseous involvement illustrates these complexities. The protracted clinical course, marked by a lack of initial definitive diagnosis, significant delay before adjuvant therapy, and subsequent pathological fracture necessitating multiple surgeries, offers critical insights into managing this uncommon entity.

Classical “B-symptoms” such as fever, drenching night sweats, and unexplained weight loss are often absent in indolent subtypes such as FL [3,13]. Symptoms typically relate to tumor mass effect, observed in this case as years of chronic back pain acutely worsened by neural compression. Meta-analyses support decompressive surgery, with 91% of PSL patients reporting symptomatic relief [6]. However, timely diagnosis is crucial to assess adjuvant therapy. Imaging alone is insufficient due to overlapping features with benign entities and lack of osteolytic abnormalities in indolent subtypes [4,6,7,15]. While structural MRI cannot reliably distinguish dense fibrosis or scar from indolent tumor, FL is characteristically FDG-avid, and PET/CT can therefore help resolve this ambiguity metabolically. In this case, the markedly elevated pre-treatment SUV_{max} (10.2 at L5 and 25.1 in the hemisacrum) confirmed metabolically active disease despite the low proliferative index, and the post-treatment resolution of FDG uptake documented complete metabolic response. Initially, pathologic reports from this case revealed dense fibrosis, mixed inflammation, and the absence of monoclonality on initial flow cytometry mimicked a benign process (“calcifying fibrous pseudotumor”), and the initial workup did not establish the diagnosis. This may be attributed to the insensitivity of flow cytometry to paucicellular, sclerotic specimens, where neoplastic follicle-center cells are sparse and diluted by reactive stroma. This highlights that indolent lymphomas such as FPSL may initially lack overt cytological atypia or overwhelming monoclonality on first sampling. Shown in this case, this may lead to therapeutic delay, necessitating further revision surgery with stabilization in the event of prolonged cortical degeneration. A high index of suspicion and intraoperative sampling are crucial to ensure timely adjuvant therapy and favorable outcomes.

R-B has shown superior outcomes in FL compared with traditional R-CHOP therapy [16-19]. While most PSL

reports include CHOP or R-CHOP, this report is, to our knowledge, one of the first documenting the use of R-B, supported by pegylated filgrastim and maintenance rituximab. The successful use of R-B in this case, achieving complete metabolic remission (documented by PET-CT) and sustained clinical improvement at one year despite extensive osseous disease and treatment delays, is significant. While further studies are needed to confirm this benefit, this report provides preliminary evidence that R-B therapy is an effective option in FPSL, even with prolonged delays to adjuvant care and multiple revision surgeries.

Conclusions

This case of lumbosacral osseous and extradural FPSL underscores the diagnostic pitfalls of indolent spinal lymphomas and the interdependence of timely diagnosis, neurological decompression, spinal stabilization, and prompt, effective adjuvant therapy. While further investigation is needed, this report suggests that modern regimens such as R-B may achieve favorable outcomes even in complex presentations of spinal FPSL, offering an alternative to historical treatments in the setting of multiple revision surgeries. Definitive diagnosis via surgical biopsy and coordination of adjuvant care by close multidisciplinary collaboration among neurosurgery, oncology, and radiology is crucial for favorable outcomes in FPSL.

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.

Concept and design: Jason Lin, Priya Rajagopalan, David Gomez, Michael M. Safaee, Sarmen Sarkissian

Acquisition, analysis, or interpretation of data: Jason Lin, Priya Rajagopalan, David Gomez, Michael M. Safaee, Sarmen Sarkissian

Drafting of the manuscript: Jason Lin, Priya Rajagopalan, David Gomez, Michael M. Safaee, Sarmen Sarkissian

Critical review of the manuscript for important intellectual content: Jason Lin, Priya Rajagopalan, David Gomez, Michael M. Safaee, Sarmen Sarkissian

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

Acknowledgements

The authors gratefully acknowledge Bikal R. Sharma, M.S., Aren Dermarderosian, B.S., Bezhad Noorbehesht, B.S., and Jeffrey Rodnick, M.D., for their support and contributions to this work.

References

1. White JD, Clarke MJ, Paludo J, Feldman AL, Sener UT: Spinal meningeal mass lesion: a rare presentation of primary dural follicular lymphoma. *Neurologist*. 2024, 29:122-5. [10.1097/NRL.0000000000000535](https://doi.org/10.1097/NRL.0000000000000535)
2. Sarro R, Bisig B, Guey B, et al.: Follicular lymphoma presenting with symptomatic bone involvement: a clinicopathologic and molecular analysis of 16 cases. *Mod Pathol*. 2024, 37:100440. [10.1016/j.modpat.2024.100440](https://doi.org/10.1016/j.modpat.2024.100440)
3. Lin Z, Zha J, Yi S, et al.: Clinical characteristics and outcomes of follicular lymphoma patients with extranodal involvement: analysis of a series of 1090 cases in China. *Clin Transl Oncol*. 2023, 25:1821-9. [10.1007/s12094-023-03081-0](https://doi.org/10.1007/s12094-023-03081-0)
4. Scheichel F, Pinggera D, Popadic B, Sherif C, Marhold F, Freyschlag CF: An update on neurosurgical management of primary CNS lymphoma in immunocompetent patients. *Front Oncol*. 2022, 12:884724. [10.3389/fonc.2022.884724](https://doi.org/10.3389/fonc.2022.884724)
5. Jiménez de la Peña MD, Vicente LG, Alonso RC, Cabero SF, Suárez AM, de Vega VM: The multiple faces of nervous system lymphoma. Atypical magnetic resonance imaging features and contribution of the advanced imaging. *Curr Probl Diagn Radiol*. 2017, 46:136-45. [10.1067/j.cpradiol.2016.04.004](https://doi.org/10.1067/j.cpradiol.2016.04.004)
6. Gendreau JL, Patel N, Brown NJ, et al.: Surgical intervention for primary B-cell lymphoma of the spine: a systematic review and meta-analysis of clinical presentation, treatment, postoperative outcomes, and histologic markers. *Clin Spine Surg*. 2024, 37:296-304. [10.1097/bsd.0000000000001522](https://doi.org/10.1097/bsd.0000000000001522)
7. Costăchescu B, Niculescu AG, Iliescu BF, Dabija MG, Grumezescu AM, Rotariu D: Current and emerging

- approaches for spine tumor treatment. *Int J Mol Sci.* 2022, 23:15680. [10.3390/ijms232415680](https://doi.org/10.3390/ijms232415680)
8. Barz M, Aftahy K, Janssen I, et al.: Spinal manifestation of malignant primary (PLB) and secondary bone lymphoma (SLB). *Curr Oncol.* 2021, 28:3891-9. [10.3390/curroncol28050332](https://doi.org/10.3390/curroncol28050332)
 9. Safaei S, Azimi P, Yazdani T, Molanaei S: Primary lymphoma of the lumbar vertebrae: a case report and review of the literature. *J Med Case Rep.* 2023, 17:45. [10.1186/s13256-022-03725-9](https://doi.org/10.1186/s13256-022-03725-9)
 10. Zakaria Mohamad Z, Kow RY, Low CL, Hamdan AH, Awang MS: Primary B-cell lymphoma of the thoracic spine: a rare cause of spinal cord compression. *Cureus.* 2021, 13:e16608. [10.7759/cureus.16608](https://doi.org/10.7759/cureus.16608)
 11. Dar SH, Wazir HS, Dar IH, Singh JB: Primary bone lymphoma with multiple vertebral involvement. *J Cancer Res Ther.* 2013, 9:487-9. [10.4103/0973-1482.119306](https://doi.org/10.4103/0973-1482.119306)
 12. Smith ZA, Sedrak MF, Khoo LT: Primary bony non-Hodgkin lymphoma of the cervical spine: a case report. *J Med Case Rep.* 2010, 4:35. [10.1186/1752-1947-4-35](https://doi.org/10.1186/1752-1947-4-35)
 13. Tsukamoto E, Nagashima Y, Nishimura Y, Kuwabara K, Saito R: Primary bone lymphoma of the spine: a case report highlighting diagnostic complexities and treatment. *Cureus.* 2024, 16:e52524. [10.7759/cureus.52524](https://doi.org/10.7759/cureus.52524)
 14. Bindal P, Desai A, Delasos L, Mulay S, Vredenburg J: Primary bone lymphoma: a case series and review of literature. *Case Rep Hematol.* 2020, 2020:4254803. [10.1155/2020/4254803](https://doi.org/10.1155/2020/4254803)
 15. Ghione P, Ahsanuddin S, Luttwak E, et al.: Diffuse large B-cell lymphoma involving osseous sites: utility of response assessment by PET/CT and good longterm outcomes. *Haematologica.* 2024, 109:200-8. [10.3324/haematol.2022.282643](https://doi.org/10.3324/haematol.2022.282643)
 16. Flinn IW, van der Jagt R, Kahl B, et al.: First-line treatment of patients with indolent non-Hodgkin lymphoma or mantle-cell lymphoma with bendamustine plus rituximab versus R-CHOP or R-CVP: results of the BRIGHT 5-year follow-up study. *J Clin Oncol.* 2019, 37:984-91. [10.1200/JCO.18.00605](https://doi.org/10.1200/JCO.18.00605)
 17. Mondello P, Steiner N, Willenbacher W, et al.: Bendamustine plus rituximab versus R-CHOP as first-line treatment for patients with follicular lymphoma grade 3A: evidence from a multicenter, retrospective study. *Oncologist.* 2018, 23:454-60. [10.1634/theoncologist.2017-0037](https://doi.org/10.1634/theoncologist.2017-0037)
 18. Flinn IW, van der Jagt R, Kahl BS, et al.: Randomized trial of bendamustine-rituximab or R-CHOP/R-CVP in first-line treatment of indolent NHL or MCL: the BRIGHT study. *Blood.* 2014, 123:2944-52. [10.1182/blood-2013-11-531327](https://doi.org/10.1182/blood-2013-11-531327)
 19. Salles G, Seymour JF, Offner F, et al.: Rituximab maintenance for 2 years in patients with high tumour burden follicular lymphoma responding to rituximab plus chemotherapy (PRIMA): a phase 3, randomised controlled trial. *Lancet.* 2011, 377:42-51. [10.1016/s0140-6736\(10\)62175-7](https://doi.org/10.1016/s0140-6736(10)62175-7)